



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

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# Memorandum

Subject: AMENDMENT NO. 4  
DTFA04-01-R-30060 Capstone  
Avionics for Southeast Alaska

Date: August 28, 2001

From: Contracting Officer, Acquisition &  
Real Estate Branch, AAL-59A

Reply to  
Attn. of:

To: Participating Parties

1. Due to several queries about the requirements for the Training Simulators as shown on the Offer Schedule Line Items 7, 8 and 9, you may contact the following individuals for information:

Leonard Kirk UAA Simulator (907) 264-7436;  
Louis Glaab NASA Simulator (757) 864-1159; and  
Kevin Williams CAMI Simulator (405) 954-6843.

2. The Closing Date shown in Block No. 8 of the SF-33 (FAA Template No. 2 8/97) is changed from September 5, 2001 to be September 12, 2001.

Karla W. Shaw



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# Memorandum

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Subject: AMENDMENT NO. 3  
DTFA04-01-R-30060 Capstone Avionics  
for Southeast Alaska

Date: August 20, 2001

From: Contracting Officer, Acquisition & Real  
Estate Branch, AAL-59A

Reply to  
Attn. of:

To: Participating Parties

The RFP has been amended.

The document is marked as Amendment No. 3, and dated August 20, 2001.

Only one page is changed. It is Page 3, Part I-Section B, Supplies/Services & Price/Cost, Offer Schedule, CLIN Item 9. The change is annotated on the right hand side margin at CLIN Item 9. "SOW E-2" has been changed to read, "SOW E-4."

The page numbers are relative to the solicitation, beginning at Part I, Section B, Supplies/Services & Price/Cost.

Karla W. Shaw



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# Memorandum

Subject: AMENDMENT NO. 2  
DTFA04-01-R-30060 Capstone Avionics  
for Southeast Alaska  
From: Contracting Officer, Acquisition & Real  
Estate Branch, AAL-59A

Date: August 17, 2001

Reply to  
Attn. of:

To: Participating Parties

The RFP has been amended.

The document is marked as Amendment No. 2, and dated August 17, 2001.

Only one page is changed. It is Page 1, Part I-Section B, Supplies/Services & Price/Cost. The change is annotated on the right hand side margin in the section titled, "Scope".

The page numbers are relative to the solicitation, beginning at Part I, Section B, Supplies/Services & Price/Cost.

Karla W. Shaw



U.S. Department  
of Transportation

**Federal Aviation  
Administration**

# Memorandum

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Subject: AMENDMENT NO. 1  
DTFA04-01-R-30060 Capstone Avionics  
for Southeast Alaska  
From: Contracting Officer, Acquisition & Real  
Estate Branch, AAL-59A

Date: July 11, 2001

Reply to  
Attn. of:

To: Participating Parties

The RFP has been amended for some minor changes.

The document is marked as Amendment No. 1, and dated July 11, 2001.

Pages where changes were made have an annotation on the right hand side margin and are as follows:

No's. 9, 14, 18, 20, 21, and 69.

Karla W. Shaw

<b>SOLICITATION, OFFER AND AWARD</b>				PAGE 1 OF 77 PAGES	
1. CONTRACT NO.		2. SOLICITATION NO. <b>DTFA04-01-R-30060</b>		3. TYPE OF SOLICITATION <input checked="" type="checkbox"/> NEGOTIATED (RFP)	
		4. DATE ISSUED <b>07/03/2001</b>		5. REQUISITION PURCHASE NO. N/AI	
6. ISSUED BY <b>FEDERAL AVIATION ADMINISTRATION ACQUISITION &amp; REAL ESTATE BRANCH, AAL-59A ATTN: KARLA W. SHAW 222 WEST 7th AVENUE #14 ANCHORAGE, ALASKA 99513-7587</b>				7. ADDRESS OFFER TO (If other than Item 6)  Address shown in Block 6	
<b>SOLICITATION</b>					
8. Sealed offers in original and <b>ONE</b> copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 6, or if handcarried, in the depository located in <b>Anchorage New Federal Building, 222 W 7th Ave, Anchorage AK - Room 358</b> until <b>2:30PM</b> local time <b>09/05/2001</b> .					
9. FOR INFORMATION CALL:		A. NAME <b>KARLA W. SHAW</b>		B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) <b>(907) 271-5859</b>	
<b>10. TABLE OF CONTENTS</b>					
(✓)	SEC.	DESCRIPTION	PAGE(S)	(✓)	SEC.
PART I - THE SCHEDULE				PART II - CONTRACT CLAUSES	
<b>X</b>	A	SOLICITATION/CONTRACT FORM	<b>1</b>	<b>X</b>	I
<b>X</b>	B	SUPPLIES OR SERVICES & PRICE/COSTS	<b>4</b>	PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.	
<b>X</b>	C	DESCRIPTION/SPECS./WORK STATEMENT	<b>43</b>		J
	D	PACKAGING AND MARKING		PART IV - REPRESENTATIONS AND INSTRUCTIONS	
<b>X</b>	E	INSPECTION AND ACCEPTANCE	<b>1</b>	<b>X</b>	K
<b>X</b>	F	DELIVERIES OR PERFORMANCE	<b>5</b>		L
<b>X</b>	G	CONTRACT ADMINISTRATION DATA	<b>1</b>	<b>X</b>	M
	H	SPECIAL CONTRACT REQUIREMENTS			
<b>OFFER (Must be fully completed by offeror)</b>					
11. In compliance with the above, the undersigned agrees, if this offer is accepted within _____ calendar days (60 calendar days unless a different period is inserted by the offeror) from the date for receipt of offers specified above, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule.					
12. DISCOUNTS FOR PROMPT PAYMENT (See FAA AMS Clause No. 3.3.1-17)		10 CALENDAR DAYS	20 CALENDAR DAYS	30 CALENDAR DAYS	CALENDAR DAYS
		%	%	%	%
13. ACKNOWLEDGMENT OF AMENDMENTS (The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated		AMENDMENT NO.	DATE	AMENDMENT NO.	DATE
14. NAME AND ADDRESS OF OFFEROR			15. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (TYPE OR PRINT)		
15B. TELEPHONE NO. (Include area code)		15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE - ENTER SUCH ADDRESS IN SCHEDULE. <input type="checkbox"/>		16. SIGNATURE	
<b>AWARD (To be completed by Government)</b>					
18. ACCEPTED AS TO ITEMS NUMBERED		19. AMOUNT		20. ACCOUNTING AND APPROPRIATION	
		21. SUBMIT INVOICES TO ADDRESS SHOWN IN		ITEM	
				23	
22. ADMINISTERED BY (If other than Item 7)				23. PAYMENT WILL BE MADE BY Federal Aviation Administration Attn: AAL-42C 222 West 7th Ave., #14 Anchorage, Alaska 99513-7587	
24. NAME OF CONTRACTING OFFICER (Type or print)				25. UNITED STATES OF AMERICA	
				(Signature of Contracting Officer)	
				26. AWARD DATE	

**PART I - SECTION B  
SUPPLIES/SERVICES & PRICE/COST**

**CAPSTONE AVIONIC SYSTEMS  
SOUTHEAST ALASKA**

**SCOPE:** The Contractor shall provide all plant, labor, tools, equipment and materials required to furnish the Federal Aviation Administration with Capstone Avionics Systems and installation kits that will be installed in a variety of general aviation and commuter type aircraft. All systems are to be delivered F.O.B. Destination, with approximately 10 of the avionics systems delivered to Anchorage, Alaska and the balance of the avionics systems delivered to Juneau, Alaska.

All work shall be performed in accordance with the Statement of Work (SOW) in Section C and all terms and conditions of the Contract.

The FAA reserves the right to make a single award or multiple awards for combinations of ~~the cContract iLine i~~ items that present the best value. ~~or, FAA may elect to either purchase a~~ Further, the FAA reserves the right to purchase all, part, or none of the proposed Capstone Avionics Equipment under this contract. ~~ii, part, or none of the proposed Capstone Equipment under this Contract. Because contract line items 3-10 support or enhance items in contract line items 1 and 2, award or awards for contract line items 3-10 will only be made, as appropriate, to vendors who are also awarded items in contract line items 1 or 2.~~

**OFFER SCHEDULE**

<u>ITEM DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL AMOUNT</u>
<b>1. FIXED-WING AVIONICS SUITES</b>	<b>ESTIMATED</b>		
a. Stand-Alone ADS-B System (SOW B-1)	150 ea	\$ _____	\$ _____
b. Navigation Display System (SOW C-1.c.)	150 ea	\$ _____	\$ _____
c. Flight Display System (SOW C-1.d)	150 ea	\$ _____	\$ _____
d. Secondary GPS/WAAS Navigator (SOW C-3.)	10 ea	\$ _____	\$ _____

**e. Installation Kits  
(SOW F-1.c.)**

**150 ea    \$ \_\_\_\_\_ \$ \_\_\_\_\_**

OFFER SCHEDULE CONT'D

	<u>ITEM DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL AMOUNT</u>
2.	ROTORCRAFT AVIONICS SUITES	ESTIMATED		
	a. Stand-Alone ADS-B System (SOW B-1)	50 ea	\$ _____	\$ _____
	b. Navigation Display System (SOW C-1.c.)	50 ea	\$ _____	\$ _____
	c. Flight Display System (SOW C-1.d)	50 ea	\$ _____	\$ _____
	d. Secondary GSP/WAAS Navigator (SOW C-3.)	5 ea	\$ _____	\$ _____
	e. Installation Kits (SOW F-2.d.)	50 ea	\$ _____	\$ _____
3.	SUBSCRIPTIONS FOR NAVIGATIONAL DATABASE (SOW B-3.c. 28-day update )	ESTIMATED 200 ea	\$ _____	\$ _____
4.	SUBSCRIPTIONS FOR OBSTRUCTION DATABASE (SOW B.4.a. (7) & B.4.b. (6) 56-day update)	ESTIMATED 200 ea	\$ _____	\$ _____
5.	SUBSCRIPTION FOR TERRAIN DATABASE (SOW B.4. a. (7) & B.4.b. (6) Quarterly update)	ESTIMATED 200 ea	\$ _____	\$ _____
6.	SUBSCRIPTIONS FOR SECONDARY GPS/WAAS NAVIGATOR (SOW C-3.D 28-day update)	ESTIMATED 15 EA	\$ _____	\$ _____



OFFER SCHEDULE CONT'D

	<u>ITEM DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL AMOUNT</u>
		ESTIMATED		
7.	AVIONICS EQUIPMENT TRAINING DEVICE (SOW E-2)	4 ea	\$ _____	\$ _____
8.	AVIONICS EQUIPMENT RESEARCH SIMULATOR (CAMI) (SOW E-4)			
	a. Hardware/Software	1 ea	\$ _____	\$ _____
	b. Engineering Support	ESTIMATED 50 hr	\$ _____	\$ _____
9.	AVIONICS EQUIPMENT RESEARCH SIMULATOR (NASA) (SOW E- <del>42</del> )			
	a. Hardware/Software	1 ea	\$ _____	\$ _____
	b. Engineering Support	ESTIMATED 50 hr	\$ _____	\$ _____
10.	a. PROVIDE TRAINING ASSISTANCE TO UAA (SOW E-1)	ESTIMATED 100 hr	\$ _____	\$ _____
	b. TRAVEL RELATED EXPENSES (Part I Section G, G-1)			ESTIMATED \$3,000.00

Actual costs incurred will be paid for travel and subsistence to the extent they do not exceed on a daily basis the maximum per diem rates in effect at the time of travel. (See Part I Section G, G-1.)

OFFER SCHEDULE CONT'D

<u>ITEM DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>TOTAL AMOUNT</u>
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THE FOLLOWING ITEMS ARE TO BE PRICED FOR INFORMATIONAL PURPOSES ONLY

11. INSTALL AN AVIONICS SYSTEM IN FIXED-WING (SOW F-1)	1 ea	\$_____	<u>XXXXXXXX</u>
12. INSTALL AN AVIONICS SYSTEM IN ROTORCRAFT (SOW F-2)	1 ea	\$_____	<u>XXXXXXXX</u>

END OF SCHEDULE

**PART I - SECTION C**  
**SCOPE OF WORK**

**STATEMENT OF WORK**  
**CAPSTONE PROGRAM**  
**SOUTHEAST ALASKA**

**BACKGROUND**

The Capstone Program accelerates efforts to improve aviation safety and efficiency through a multi-year introduction of current and emerging concepts and technologies. The absence of services, such as radar, makes Alaska the ideal location to evaluate key new communications, navigation, and surveillance (CNS) technologies. These technologies can better allow pilots to deal with navigation, terrain, traffic, and weather hazards.

Current Capstone planning is focused on two regions of Alaska: Capstone Phase I addresses the Bethel/Yukon-Kuskokwim (Y-K) delta area and Capstone Phase II addresses the Juneau/Southeast (SE) Alaska area.

During Phase II, which begins in 2001, Capstone will incorporate technologies matured in the Bethel/Y-K area, build on lessons learned, and explore expansion of the use of other risk mitigating technologies to reduce accidents and fatalities in the Southeast area of Alaska. In order to ensure each new component slated for development dovetails with industry safety needs, representatives from Capstone have met with local industry representatives to establish goals and objectives for future work in Southeast Alaska. This provides new challenges because of the vastly different operating conditions for this meteorologically diverse, mountainous, and maritime environment. The industry in SE Alaska has described their view of success in advancing safety as a "more useable IFR infrastructure," with focus on navigational capability for lower enroute altitudes, improved communications, weather information, surveillance, Controlled Flight into Terrain (CFIT) protection, and traffic awareness. Avionics that incorporate technologies such as Automatic Dependence Surveillance – Broadcast (ADS-B), augmented Global Positioning System (GPS) - Wide Area Augmentation System (WAAS), Terrain Awareness and Warning Systems (TAWS), forward looking perspective view concept Flight Display (FD), and a Navigation Display (ND) are envisioned to improve operational safety in Southeast Alaska.

\* \* \* \* \*

## **A-0 GENERAL REQUIREMENTS**

**A-1.** The successful offeror will provide to the Federal Aviation Administration (FAA) between 100 and 150 Capstone Avionics Suites and installation kits for installation in a variety of general aviation and commuter type fixed wing aircraft. The successful offeror will also provide the FAA between 25 to 50 Capstone Avionics Suites and installation kits for installation in a variety of rotorcraft. The avionics suites should be similar in operations for both fixed-wing and rotorcraft. Our intent is to purchase a minimum of 125 avionics suites, of which 25 suites may be for the rotorcraft. Seventy-five (75) additional suites may be purchased. The maximum number of avionics suites purchased will not exceed 200 suites.

**Note:**

1. The typical fixed-wing aircraft to be equipped are Cessna Models 172, 180, 182, 185, 206, 207, 208, Cessna light twin-engine airplanes, Piper single-engine airplanes, Piper twin-engine airplanes, Beech twin-engine airplanes, and DeHavilland Models DHC-2, DHC-3, DHC-6.
2. The rotorcraft to be equipped are Hughes 269/369, Bell 206, Eurocopter 350, Eurocopter 135, and Bell 212.
3. Minimizing size and weight will be important. For fixed-wing aircraft, the size and weight of the avionics system should be designed to be installed in a Cessna Model 172 size aircraft. For rotorcraft, the size and weight of the avionics system should be designed for the installation in a Eurocopter 350.
4. Should the offeror determine that the cost of the avionics equipment for the fixed-wing aircraft is different than the avionics equipment for the rotorcraft the prices are to be shown on the Offer Schedule. If there is no difference in the price, the Offer Schedule shall be annotated as such.

**A-2.** This document specifies the requirements for fixed-wing aircraft and for rotorcraft. In some paragraphs the requirements address both the fixed-wing and the rotorcraft. When requirements are specific for the fixed-wing or rotorcraft the paragraphs are clearly marked fixed-wing or rotorcraft.

## **A-3. CAPSTONE SUITES.**

The Capstone avionics suites shall consist of a stand-alone Automatic Dependence Surveillance – Broadcast (ADS-B) System, a Technical Standard Order (TSO)-C146 Class Gamma 2 GPS/WAAS Navigation System (except as noted in B-1) incorporated into a Navigation Display (ND), a Flight Display (FD), and other airborne Capstone avionics equipment and required antennas as required to perform the Capstone functions. The equipment shall be upgradeable to Class Gamma 3 GPS/WAAS equipment.

**a. FIXED-WING AIRCRAFT**

The intent of the avionics system will be to reduce pilot workload, increase pilot situational awareness, and increase navigational performance during IFR operations by providing the following:

(1). A stand-alone ADS-B datalink system that is capable of transmitting ownship ADS-B messaging and receiving ground uplinks and other ADS-B equipped aircraft broadcasts. The system shall then export that information to the displays that require traffic surveillance information.

(2). A Navigation Display (ND) System that is capable of displaying moving map (reference RTCA/DO-257), navigational guidance information, Flight Information Services (FIS), obstructions, Terrain Awareness and Warning System information (TAWS), traffic information, and Traffic Information Services-Broadcast (TIS-B).

(3). A Flight Display (FD) System that is capable of displaying a forward looking perspective view concept consisting of an integrated 3-D view of some type of lateral and vertical navigational guidance for the intended route, Terrain, Obstacles and Traffic, and other flight information.

(4). A secondary GPS/WAAS Navigator meeting the requirements of TSO C-146 may be required for some of the IFR installations on aircraft operating in accordance with 14 CFR Part 135.

**b. ROTORCRAFT**

The installation of the avionics suites covered by this Statement of Work (SOW) are considered non-required equipment that is to be installed on a no-hazard basis and is to be limited to VFR navigation only. The intent of the avionics system will be to supplement VFR operations by providing equipment that will assist the pilot to reduce pilot workload, increase pilot situational awareness, CFIT, collision avoidance, and increasing navigational performance that will meet IFR requirements by providing the following:

(1). A stand alone ADS-B datalink system that is capable of transmitting ownship ADS-B messaging and receiving ground uplinks and other ADS-B equipped aircraft broadcasts. The system shall then export that information to the displays that require traffic surveillance information.

(2). A Navigation Display that is capable of displaying moving map (reference RTCA/DO-257), navigational guidance information, Flight Information Services (FIS), obstructions, Terrain Awareness and Warning System information (TAWS), traffic information, and Traffic Information Services-Broadcast (TIS-B).

(3). A Flight Display that may be capable of displaying a forward looking perspective view concept consisting of an integrated 3-D view which may provide some type of lateral and vertical navigational guidance for the intended route, Terrain, Obstacles

and Traffic, and other essential flight information. This display will not replace an Attitude Display Indicator (unless shown to be equivalent) and will have a means for quick, declutter capability in order to retrieve basic instruments for inadvertent IMC and unusual attitude recovery.

(4) A secondary GPS/WAAS Navigator meeting the requirements of TSO C-146 may be required for some of the IFR installations on aircraft operating in accordance with 14 CFR Part 135.

**A-4.** The avionics suites shall be economically feasible for general aviation aircraft/small commercial users. For the purpose of these suites, FAA has defined an “economically feasible” cost as not to exceed \$30,000.00.

**A-5.** The FAA reserves the right to make a single award or multiple awards for combinations of the Contract Line Items that present the best value, or may elect to either purchase all, part, or none of the proposed Capstone Equipment.

**A-6.** All software and firmware shall be capable of being upgraded. ~~Software and firmware cannot reside on an external memory card.~~ Operating Systems cannot reside on an external memory card. One upgrade that may be required is the ability to record avionics or other systems performance data.

**A-7.** Database upgrades shall be easily accomplished without requiring removal of the avionics systems from the aircraft. The field loadable scheme shall contain a means of detecting corruption of the software data during the software load.

**A-8.** The Capstone avionics equipment and installation of that equipment shall be certified in accordance with the applicable Federal Aviation Regulations not later than 120 days after the notification of contract award. The stand-alone ADS-B system shall be certified in accordance with the applicable Federal Aviation Regulations not later than 180 days after the RTCA approves a Minimum Operational Performance Specification (MOPS) for the UAT ADS-B system.

**A-9.** Before delivery of the Capstone avionics suites, the offeror shall have Federal Aviation Administration installation approval and Parts Manufacturer Approval (FAA/PMA) in accordance with 14 CFR Part 21.303, Part 21 Subpart E, and/or Technical Standard Order (TSO) authorization.

**A-10.** The avionics suites shall be designed to support four levels of equipage. The first level is equipping an aircraft with a stand-alone ADS-B system only. The second level of equipage will be the ADS-B system and the Navigation Display. The third level of equipage will be the ADS-B system and the Navigation Display and the Flight Display. The fourth level of equipage will be with the ADS-B system, the Navigation Display, the Flight Display and the secondary GPS/WAAS Navigator. The offeror should recommend the level of equipage for specific rotorcraft.

## A-11. HUMAN FACTORS

### a. FIXED-WING AIRCRAFT

The offeror must demonstrate a commitment to a human centered design process by providing evidence that demonstrates knowledge of human factors design principles. The offeror must also provide information that will allow human factors assessments of the system during the proposal evaluation process. A human factors report shall be submitted by the offeror. The report shall contain the following sections:

(1). **Introduction:** The introduction shall contain a high level discussion of how human factors issues will be addressed throughout the product development process. It should reference the development process outlined in ARP 4033, "Pilot System Integration", GAMA Publication No 10, "Recommended Practices and Guidelines for Part 23 Cockpit/Flight Deck Design, or a similar human factors development process.

(2) **References:** This section should catalogue all the documents that the applicant is going to use during the design process, including all FAR references of regulations that are tied to human factors issues (e.g., 23.1311 electronic displays).

(3). **System Description:** The system description should contain a detailed discussion of every component (hardware and software) in the system containing a user interface, including the following:

(a). Relative size of screens and controls, number of controls used (including programmable controls), display characteristics (brightness, pixel resolution and color depth), number of pages used, menu structure information (number of menus, maximum menu choices, maximum menu depth).

(b). Detailed screen shots of each of the required displays, including, 1) Flight Display demonstrating the lateral and vertical navigational guidance for the intended route symbology and primary flight information (i.e., airspeed, altitude, heading, attitude, flight path marker and vertical velocity) and, the integrated perspective (3-D) terrain, obstacles, and traffic symbology; 2) Navigation Display with a separate screen shot of each of the proposed screens, including moving map with navigational guidance information displayed, weather information, terrain awareness and warning system (TAWS) information, and traffic information \*Note – at least one of the traffic display pictures should show the display at a 5-mile scale, with at least two aircraft within 0.25 mile of each other; and 3) a picture of the displays that will include the proposed controls for interacting with the displays (buttons, knobs, etc.). Information regarding the size and appearance of the controls should be included with the screen shots.

(c). If the displays designed for use in rotorcraft operations differ from those used for fixed-wing aircraft, they should also be included in the report, along with notation that describes the differences.

(d). Each screen shot should be actual size and in color to accurately depict the proposed color schemes for the displays.

(e). A detailed description, in the form of a task analysis, of how navigation information will be entered into the system shall be submitted. This description will include all tasks involved with the manual entry of an instrument approach procedure originating from Juneau and terminating in Gustavus, including all button presses, knob turns, menu selections, etc. The description should begin with system power-up and conclude with the aircraft landing at Gustavus. A second task analysis will include all tasks involved with the entry and flight of a VFR navigation route going from Ketchikan to Mendenhall Glacier. The route should include a stop in Juneau.

(4). **System Design Issues:** The important principles of human centered design and considerations of human cognitive and physical capabilities and limitations must be applied to the design of the hardware and software of each component in the system, as human error is a principal cause of aircraft accidents of any type. This section shall detail both the human-factors issues encountered in the design process and the specific human-factors guidelines or principles followed to address those issues, including a FAR reference. Following, are several example issues and their associated FAR references:

(a). Are controls located to provide convenient and accurate operations, yet prevent confusion and inadvertent operation? FAR 23.777, 23.671

(b). Are labels easy to read and understand? FAR 23.1301, 23.1555

(c). Does the display provide only useful information and remain uncluttered without providing any confusion or distractions? FAR 23.1301, 23.1322

(d). Is the system status obvious at all times so that the pilot is not required to rely on memory to determine the condition or status of the system? FAR 23.1301, 23.1322

(e). Is the failure of any system component quickly, clearly, and readily apparent to the pilot? FAR 23.1301, 23.1322

(f). Is the display symbology easily and clearly visible to the pilot at all times? FAR 23.1311

(g). Does any of the displayed symbology cause any confusion or have the potential to be misleading to the pilot? FAR 23.1301

(h). Are the displays free from glare and reflections? FAR 23.1311

Additionally, human factors principles must be applied to the integration of the various sub-systems to yield a human centered system concept. Consideration must be made of how information portrayal within one display will interact with information portrayal within other displays or sub-systems. This section shall identify the efforts made to integrate across subsystems of the pilot/vehicle interface consistent with human-factors design practices. For example, consistent symbology, alphanumeric representation or syntax, color coding, and input keying procedures (switchology) were applied for like informational elements across the display systems, where such consistency was applicable (e.g., functional integration of alert, terrain, surveillance, and navigation information elements). Integration niceties, such as a representation on the ND moving map of the forward field-of-view presently covered by the FD, shall be identified.



(5). **Evaluation Plan:** This section shall describe evaluation objectives and methods. The section should contain a matrix that cross-references the system design issues identified in section IV with a compliance method (e.g., bench test, flight test, usability study, etc.) that will be used to ensure that the issue has been addressed.

## **b. ROTORCRAFT**

The offeror must demonstrate a commitment to a human centered design process by providing evidence that demonstrates a knowledge of human factors design principles. The offeror must also provide information that will allow human factors assessments of the system during the proposal evaluation process (Reference FAA policy ANM-99-2 Guidance for Reviewing Certification Plans to Address Human Factors for Certification of Transport Airplanes and FAA policy ANM-01-03 Guidance for Reviewing Human Factors Methods of Compliance for Flight Deck Certification). A human factors report shall be submitted by the offeror. The report shall contain the following sections:

(1) **Introduction:** The introduction shall contain a high level discussion of how human factors issues will be addressed throughout the product development process. It should reference the development process outlined in ARP 4033, "Pilot System Integration" or a similar human factors development process.

(2) **References:** This section should catalogue all the documents that the applicant is going to use during the design process, including all FAR references of regulations that are tied to human factors issues (e.g., 27.1321 Arrangement and Visibility).

(3) **System Description:** The system description should contain a detailed discussion of every component (hardware and software) in the system containing a user interface, including the following:

(a) Relative size of screens and controls, number of controls used (including programmable controls), display characteristics (brightness, pixel resolution and color depth), number of pages used, menu structure information (number of menus, maximum menu choices, maximum menu depth).

(b) Detailed screen shots of each of the required displays, including, 1) flight display demonstrating the lateral and vertical navigational guidance for the intended route symbology and essential flight information (i.e., airspeed, altitude, heading, attitude, flight path marker and vertical velocity) and, the integrated perspective (3-D) terrain, obstacles, and traffic symbology; 2) Navigation Display with a separate screen shot of each of the proposed screens, including moving map with navigational guidance information displayed, weather information, terrain awareness and warning system (TAWS) information, and traffic information \*Note – at least one of the traffic display pictures should show the display at a 5-mile scale, with at least two aircraft within 0.25 mile of each other; and 3) a picture of the displays that will include the proposed controls for interacting with the displays (buttons, knobs, etc.). Information regarding the size and appearance of the controls should be included with the screen shots.

(c). If the displays designed for use in rotorcraft operations differ from those used for fixed-wing aircraft, they should also be included in the report, along with notation that describes the differences.

(d). Each screen shot should be actual size and in color to accurately depict the proposed color schemes for the displays.

(e). A detailed description, in the form of a task analysis, of how navigation information will be entered into the system shall be submitted. This description will include all tasks involved with the manual entry of an instrument procedure originating from Juneau and terminating in Gustavus, including all button presses, knob turns, menu selections, etc. The description should begin with system power-up and conclude with the aircraft landing at Gustavus. A second task analysis will include all tasks involved with the entry and flight of a VFR navigation route going from Ketchikan to Mendenhall Glacier. The route should include a stop in Juneau. In both the VFR and IFR description, the procedure should consider how to add a waypoint in route, delete a waypoint, and create a new waypoint that may not exist in the data base due to the need for an emergency VFR descent. Also, the procedures shall cover "Direct-To" waypoints.

(4). **System Design Issues:** The important principals of human centered design and considerations of human cognitive and physical capabilities and limitations must be applied to the design of the hardware and software of each component in the system, as human error is a principal cause of aircraft accidents of any type. This section shall detail both the human-factors issues encountered in the design process and the specific human-factors guidelines or principals followed to address those issues, including a FAR reference. Following, are several example issues and their associated FAR references:

(a). Are controls located to provide convenient and accurate operations, yet prevent confusion and inadvertent operation? FAR 27/29.777, 27/29.671, 27/29.1309

(b). Are labels easy to read and understand? FAR 27/29.1301, 27/29.1321, 27/29.1555

(c). Does the display provide only useful information and remain uncluttered without providing any confusion or distractions? FAR 27/29.1301, 27/29.1309, 27/29.1322

(d). Is the system status obvious at all times so that the pilot is not required to rely on memory to determine the condition or status of the system? FAR 27/29.1301, 27/29.1322

(e). Is the failure of any system component quickly, clearly, and readily apparent to the pilot? FAR 27/29.1301, 29.1309c, 27/29.1322

(f). Is the display symbology easily and clearly visible to the pilot at all times? FAR 27/29.1321, 27/29.1541, 27/29.1543

(g). Does any of the displayed symbology cause any confusion or have the potential to be misleading to the pilot? FAR 27/29.1301, 27/29.1309

(h). Are the displays free from glare and reflections? FAR 27/29.773

(i). Do the displays require the pilot's attention (physical, cognitive, or temporal) to use that the pilot's primary flying duties are affected? 27/29.771, 27/29.1523.

Additionally, human factors principals must be applied to the integration of the various sub-systems to yield a human centered system concept. Consideration must be made of how information portrayal within one display will integrate with information portrayal within other displays or sub-systems. This section shall identify the efforts made to integrate across subsystems of the pilot/vehicle interface consistent with human-factors design practices. For example, consistent symbology, alphanumeric representation or syntax, color coding, and input keying procedures (switchology) were applied for like informational elements across the display systems, where such consistency was applicable (e.g., functional integration of alert, terrain, surveillance, and navigation information elements). Integration niceties, such as a representation on the ND moving map of the forward field-of-view presently covered by the FD, shall be identified.

(5). **Evaluation Plan:** This section shall describe evaluation objectives and methods. The section should contain a matrix that cross-references the system design issues identified in section IV with a compliance method (e.g., bench test, flight test, usability study, etc.) that will be used to ensure that the issue has been addressed.

## A-12. PUBLICATIONS

Copies of the RTCA Inc. documents cited in this Statement of Work are available from the following:

RTCA, Inc.  
1140 Connecticut Avenue, NW, Suite 1020  
Washington, D.C. 20036-4001

Telephone: (202) 833-9339  
Internet: <http://www.rtca.org>

Copies of the Flight Information Publication, Alaska Supplement, are available from the U.S. Department of Commerce, NOAA.

## **B-0 CAPSTONE AVIONICS SYSTEM PERFORMANCE REQUIREMENTS**

### B-1. AUTOMATIC DEPENDENCE SURVEILLANCE - BROADCAST (ADS-B)

a. Packaging. The ADS-B system shall be a single line replaceable unit that includes a navigation sensor meeting requirements of paragraph B-2-(b) B.1.b. below. The system shall have the capability to receive altitude data from an external altitude encoder and is permitted to use this information to report altitude.

b. Navigation Sensor: The latitude and longitude position information will be provided by WAAS/GPS sensor, compliant with either TSO C145 or TSO C146, with the exception that the performance standard shall be the final draft of RTCA/DO-229C, dated May 17, 2001, in lieu of RTCA/DO-229B. Horizontal position integrity shall be based upon

the RAIM/FDE or WAAS horizontal protection level (HPL) when available. (Note the TSO allows for RAIM integrity when WAAS is not available). Vertical position information will be provided by a barometric altitude reporting system

c. ADS-B data link medium: Capstone's ADS-B data link medium is the Universal Access Transceiver (UAT). The ADS-B system shall meet the requirements of the RTCA SC-186 UAT MOPS or a DRAFT MOPS deemed sufficiently mature by the FAA to form the basis for a specification. It is anticipated that mature DRAFT MOPS will be available by December 2001, with the finalized version by February 2002. The system shall meet the requirements for the equipment class specified in the MOPS that is appropriate for the intended function of the ADS-B system.

d. Required data elements: The ADS-B system shall support at a minimum the required data elements to meet the intended function. The system shall also support the payload portion of UAT Uplink Messages per the MOPS.

e. Intended Function of the ADS-B system: The intended function of the ADS-B system is two fold. The first is to broadcast aircraft position to be used by air traffic control (ATC) for surveillance (Radar Like Services). The second is to support enhanced see and avoid and provide surveillance information to the Traffic Advisory and Conflict Detection System (see B-3 below) through air-air reception of ADS-B messages and the use of an onboard display system.

f. Applicable portions of RTCA Document No. RTCA/DO-242, Minimum Aviation System Performance Standards for Automatic Dependence Surveillance-Broadcast (ADS-B), as they pertain to the intended function shall be used in the design of the ADS-B.

g. The ADS-B system shall accommodate a means to ensure anonymity whenever pilots elect to operate under flight rules permitting an anonymous mode. (Most non-IFR flight operations do not require full disclosure of the aircraft's call sign or address. This feature is provided to encourage voluntary operation of ADS-B by ensuring that ADS-B messages will not be traceable to an aircraft operating under flight rules that permit anonymity.)

h. The system should have a maintenance interface to configure the system during installation. The ability to change safety related system configurations shall not be accessible by the pilot.

i. The software shall comply with RTCA Document No. RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, software level C requirements.

j. The equipment shall meet the appropriate requirements of RTCA Document No. RTCA/DO-160D, Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

## **B-2. ENHANCED SEE AND AVOID -- TRAFFIC ADVISORY AND CONFLICT DETECTION SYSTEM (Aid to Visual Acquisition)**

The following are the minimum requirements for a Traffic Advisory and Conflict Detection System:

- a. Traffic shall be displayed on the Navigation Display (ND). The traffic display shall be adjustable in both range and altitude to declutter the display of targets. Traffic display should show traffic information 360 degrees around the aircraft.
- b. Display features should be developed in accordance with the RTCA SC-186 Cockpit Display of Traffic Information (CDTI) MOPS DRAFT version 3.0 (or newer).
- c. Traffic symbology shall be sized such that, when the ND is at a 5-mile scale, traffic within 0.25 mile of each other are distinguishable from each other.
- d. Traffic shall be displayed on the ND within +/- 1/8 mile; +/- 10 degrees; +/- 200 feet altitude of actual position.
- e. Conflict detection requirements should be similar to those specified in RTCA/DO-197, Minimum Operational Performance Standards for An Active Traffic Alert and Collision Avoidance System I (Active TCAS I).
- f. Traffic warning should state "Traffic, Traffic". Each threat aircraft shall be distinguishable from other traffic. Aural warnings shall be given for each threat aircraft. After each aural warning, the display shall present traffic information in a 360 degree view. This warning shall be pilot cancellable.
- g. Traffic Advisory and Conflict Detection System for the Capstone project shall receive traffic information for all line-of-sight participating aircraft equipped with ADS-B within 100 NM. This also supports the desired range for ATC radar-like services.
- h. The Traffic Advisory and Conflict Detection System shall be capable of receiving and displaying, on the ND, Traffic Information Services-Broadcast (TIS-B) data.
- i. The minimum information displayed on the ND shall be own aircraft symbol, traffic symbol, traffic relative range, traffic relative bearing, traffic barometric altitude with respect to own aircraft barometric altitude, and if the traffic is climbing or descending. If a specific aircraft icon is used then the aircraft symbol should be a helicopter if it is helicopter traffic, or an airplane if it is fixed-wing (at least distinguishable from one another).
- j. ADS-B traffic information shall be updated at an interval not to exceed 4 seconds.
- k. The Traffic Advisory and Conflict Detection System symbology shall not be confusing to the user with Traffic Alert and Collision Avoidance System (TCAS) symbology.

l. TIS-B target position information shall be suppressed whenever ADS-B traffic information is available for the same traffic aircraft.

m. Traffic symbology shall be displayed on the FD when the traffic is within the display's conformat field-of-view and within a 5 NM range. The pilot shall be provided convenient means to declutter the display of targets on the FD.

n. The software shall comply with RTCA Document No. RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, software level C requirements.

o. The equipment shall meet the appropriate requirements of RTCA Document No. RTCA/DO-160D, Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

### **B-3. NAVIGATION**

The following are the minimum performance requirements for a Capstone Navigation System:

a. The GPS/WAAS-based navigation system shall meet the requirements of a Technical Standard Order (TSO)-C146, Functional Class Gamma Operations Class 2, with the exception that performance shall be based on the final draft of RTCA/DO-229C, dated May 17, 2001, in lieu of RTCA/DO-229B. For additional requirements for the rotorcraft equipment refer to Appendix Q of RTCA/DO-229C, dated May 17, 2001.

b. The IFR navigation database, as a minimum, shall contain all enroute, terminal, and non-precision approach information for the State of Alaska. It is preferred that all the navigational information for Alaska should be on one data card. However, if the navigational information is on more than one card, the operator shall not be required to remove one card and insert another card during flight. This navigational information shall be capable of being updated.

c. The offeror shall provide the IFR navigation database updates for the TSO-C146 Class Gamma 2 GPS/WAAS Navigation Systems for each aircraft equipped with Capstone avionics equipment until December 31, 2005. The navigational database shall be updated, as a minimum, on a 28-day cycle.

d. The GPS-based navigation system shall be able to transfer GPS position data, GPS altitude, corrected barometric altitude data, and GPS time to other Capstone avionics systems.

e. The software operating system must reside internally to the system.



f. The software level for a GPS/WAAS based navigation system shall meet the appropriate level sought in the TSO and shall comply with RTCA Document No. ~~RTCA/DO-178B~~. RTCA/DO-178B.

g. The GPS/WAAS based navigation system shall meet the appropriate requirements of RTCA Document No. RTCA/DO-160D, Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

#### **B-4. COST EFFECTIVE TERRAIN ALERT AND WARNING SYSTEM**

##### **a. FIXED-WING AIRCRAFT**

The following are the minimum requirements for a **Terrain Alert and Warning System (TAWS)**:

(1). The FD and ND should incorporate a terrain alert and warning system. The system should be based on the Class B TAWS TSO C-151a, modified using the exceptions described in Appendix A for small airplanes. The Capstone TAWS equipment should follow the proposed guidance because it is targeted for light airplane and helicopter operations. Consideration, however, should be given to Alaska unique operations. Deviations from the TSO or Appendices may be allowed but clearly explained.

(2). The TAWS should be integrated into the navigation display (and the FD if practical) such that the topographical terrain colors (greens, yellows, and red) relate to the airplane's actual position relative to the terrain. Current GA color topographical moving maps that recreate existing VFR charts are helpful but do not account for the airplane's current altitude. The colors need to relate directly to the terrain at and above the airplane's altitude for constant pilot terrain awareness.

(3). Terrain and Obstacles database – As a minimum, terrain and obstacles information shall be provided for the State of Alaska, Yukon Territory, and British Columbia. Airport information (location and elevation of runway ends and Airport Reference Point) shall be provided for all runways listed in the Flight Information Publication Alaska Supplement. All terrain information should be on one data card or implemented such that the terrain data will not need to be loaded by the pilot in flight. Also, this terrain and obstacle information shall be updateable.

(4). The TAWS system shall be appropriate for the type of aircraft and its operation. Aircraft in southeast Alaska are approved to operate VFR at 500 feet AGL with 2 miles visibility. Some floatplane operations are allowed to operate at 200 ft AGL and clear of clouds in the Ketchikan area. These operations are in mountainous areas where controlled-flight-into-terrain is a real threat. The TAWS equipment should operate in this environment without nuisance warnings.

(5). TAWS information shall be displayed, on the Navigation Display, when a terrain conflict is noted.

(6). The terrain and obstacle data shall be of the accuracy and resolution suitable for the system to perform its intended function. As a minimum, the terrain data shall be 6 arc seconds with 100-foot accuracy. As a minimum, obstacles greater than 200 AGL shall be included in the database.

(7). The obstacle database shall be updated at a 56-day update cycle. The terrain database shall be updated on a quarterly basis. The offeror shall provide updates until December 31, 2005.

#### **b. ROTORCRAFT**

The following are the minimum requirements for a **Terrain Alert and Warning System (TAWS)**:

(1). The FD and ND should incorporate a terrain alert and warning system. The system should be based on the Class B TAWS TSO C-151a modified using the exceptions described in Appendix B for rotorcraft. The Capstone TAWS equipment should follow the proposed guidance because it is targeted for light airplane and helicopter operations. Consideration, however, should be given to Alaska unique operations. Deviations from the TSO or Appendices may be allowed but clearly explained.

(2). The TAWS should be integrated into the navigation display (and the FD if possible) such that the topographical terrain colors (greens, yellows, and red) relate to the helicopter's actual position relative to the terrain. Current GA color topographical moving maps that recreate existing VFR charts are helpful but do not account for the airplane's current altitude. The colors need to relate directly to the terrain and the airplane's altitude in respect to feet AGL for constant pilot terrain awareness. See HTAWS Terrain Map Colors in the Appendix for reference. In addition, the display must meet Class A display requirements even if the TAWS system is Class B.

(3). Terrain and Obstacles database – As a minimum, terrain and obstacles information shall be provided for the State of Alaska, Yukon Territory, and British Columbia. Airport information (location and elevation of runway ends and Airport Reference Point) shall be provided for all runways listed in the Flight Information Publication Alaska Supplement. All terrain information should be on one data card or implemented such that the terrain data will not need to be loaded by the pilot in flight. Also, this terrain information shall be updateable.

(4). TAWS information shall be displayed, on the Navigation Display, when a terrain conflict is noted. In addition, this conflict shall be presented in the 360 degree view.

(5). The terrain and obstacle data shall be of the accuracy and resolution suitable for the system to perform its intended function. As a minimum, the terrain data shall be 6



arc seconds with 100-foot accuracy. As a minimum, obstacles greater than 200 AGL and 100 AGL within 5 miles of an airport shall be included in the database.

(6). The obstacle database shall be updated at a 56-day update cycle. The terrain database shall be updated 4 times per year. The offeror shall provide updates until December 31, 2005.

(7). The software shall comply with RTCA Document No. RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, software level C requirements.

(8). The equipment shall meet the appropriate requirements of RTCA, Inc. Document No. RTCA/DO-160D Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

#### **B-5. FLIGHT INFORMATION SERVICES (FIS)**

a. The Capstone avionics system shall be capable of receiving up-linked weather (e.g., METAR, TAF, NEXRAD, icing conditions), NOTAMS and Special Use Airspace.

b. The information shall be displayed via text and graphics in the cockpit on the Navigation Display.

c. The software shall comply with RTCA Document No. RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, software level D requirements.

d. The equipment shall meet the appropriate requirements of RTCA Document No. RTCA/DO-160D, Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

#### **C-0. CAPSTONE AVIONICS SYSTEM EQUIPMENT REQUIREMENTS**

a. If multiple software levels are utilized, software protection/partition shall exist to ensure lower software levels do not affect higher software levels.

b. The Capstone avionics system shall meet the appropriate requirements of RTCA Document No. ~~RTCA/DO-160D~~ RTCA/DO, 160D, Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

## **C-1 ADS-B Transceiver**

a. The ADS-B system shall be a single line replaceable unit that includes a navigation sensor meeting requirements of paragraph B-2 (b) below B.1.b. The system shall have the capability to receive altitude data from an external altitude encoder and is permitted to use this information to report altitude.

b. A means shall be provided that allows the pilot to interface with the ADS-B Transceiver. As a minimum, the pilot shall be able to turn the system on, off, or to a stand-by mode, enter flight ID, select anonymous mode, select emergency message broadcast, and IDENT.

c. The software shall comply with RTCA Document No. RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, software level C requirements.

d. The equipment shall meet the appropriate requirements of RTCA Document No. RTCA/DO-160D, Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

## **C-2 Navigational Display (ND)/Flight Display (FD)**

### **a. General**

(1). The important principles of human centered design and other considerations of human cognitive and physical capabilities and limitations should be applied to the design of the hardware and software of each component in the system. Additionally, the same human-factors principles should be applied to integration across the various sub-systems to yield a human centered *system* concept. Consideration should be made for how information portrayal within one display will interact with information portrayal within other displays or sub-systems.

(2). The TAWS should be integrated into the navigational display (and the FD if practical).

(3). Common settings such as the barometric altimeter setting (which should only be needed until WAAS is implemented), should be integrated so that only one entry is needed to update the entire system.

(4). Integration niceties across the ND and FD should include a representation on the ND moving map of the forward field-of-view presently covered by the FD.

### **b. Display System Requirements – FIXED-WING AIRCRAFT**

(1). The avionics equipment should be economically feasible for general aviation aircraft and small commercial users. To achieve lower cost and be on the forefront of

technological needs Commercial Off-The-Shelf (COTS) software and hardware may be used for some applications. A safety assessment process should be used to determine the appropriate Software Development Assurance Level in accordance with Advisory Circular (AC) 23.1309-1C, Equipment, System, and Installations in Part 23 Airplanes. The electronic hardware should consider some structured development processes such as the guidelines in RTCA/DO-254, "Design Assurance Guidance for Airborne Electronic Hardware" or another process that are acceptable to the FAA.

(2). The display should be an Active Matrix Liquid Crystal Display (AMLCD). The installation of the equipment should consider the guidelines in accordance with Advisory Circular (AC) 23-1311-1A.

(3). The screen size for the display should be appropriate for the intended function of the display. Screen display size will be one of the criteria used in rating the proposals.

(4). The equipment shall be capable of being upgraded.

(5). The Capstone avionics system equipment and installation of that equipment will be certified in accordance with the applicable Federal Aviation Regulations. The installation of the equipment will be approved by Supplemental Type Certificate (STC). After the installation, a FAA Approved Avionics Repair Station will return the aircraft to service.

(6). The Display shall be readable in direct sunlight and must be dimmable for night.

(7). Ideally, the system should be designed to preclude display clutter. Early analysis needs to be performed to ensure that the display size, and functions integrated onto that display, are adequate and do not impede rapid recognition and reduce response time or situation awareness. Every effort should be made to provide only the information necessary to perform the intended task. If a declutter option is considered the control of that function needs to be a top level function, not buried deep into a lower display menu. The offerors design needs to address this issue in their proposal to include a detailed design/descriptions for all integrated functions.

(8). Information overlaid on the ND and FD should be updated concurrently with the rest of the display to avoid "flashing" or other distracting appearances.

(9). The Capstone avionics system shall meet the appropriate requirements of RTCA, Inc. Document No. RTCA/DO-160D Change 1, Environmental Conditions and Test Procedures for Airborne Equipment.

(10). The Capstone avionics equipment shall be FAA Parts Manufacturer Approval (PMA) or Technical Standard Order (TSO) in accordance with CFR 14 Part 21.303 or 21.601 respectively.

(11). A special condition is necessary to ensure that each electrical and electronic system which performs critical functions is designed and installed so that the operation and

operational capabilities of the system to perform critical functions are not adversely affected when the airplane is exposed to high intensity radiated fields external to the airplane. The term "critical" means those functions whose failure would contribute to, or cause, a failure condition that would prevent the continued safe flight and landing of the airplane. The critical function may be determined using the Functional Hazard Assessment (FHA) provided it is reviewed and approved by the FAA. The test levels are in Action Notice N8110.71: Guidance for the Certification of Aircraft Operating in High Intensity Radiated Field (HIRF) environments, dated April 2, 1998.

### **c. Display System Requirements – ROTORCRAFT**

(1). The avionics equipment should be economically feasible for general aviation aircraft and small commercial users or both. A safety assessment process should be used to determine the appropriate Software Development Assurance Level in accordance with AC 27-1B or 29-2C, Section 1309 for its intended operation. The electronic hardware should consider some structured development processes such as the guidelines in RTCA/DO-254, "Design Assurance Guidance for Airborne Electronic Hardware" or another process that are acceptable to the FAA.

(2). The display should be an Active Matrix Liquid Crystal Display (AMLCD). The installation of the equipment should consider the guidelines in accordance with Advisory Circular (AC) 27-1B or 29-2C.

(3). The screen size for the display should be appropriate for the intended function of the display. Screen display size will be one of the criteria used in rating the proposals.

(4). The equipment shall be capable of being upgraded for potential future requirements.

(5). The Capstone avionics system equipment and installation of that equipment will be certified in accordance with the applicable Federal Aviation Regulations. The installation of the equipment will be approved by Supplemental Type Certificate (STC). After the installation, a FAA Approved Avionics Repair Station will return the aircraft to service.

(6). The Display shall be readable in direct sunlight and must be dimmable for night.

(7). Ideally, the system should be designed to preclude display clutter. Early analysis needs to be preformed to ensure that the display size, and functions integrated onto that display, are adequate and do not impede rapid recognition and reduce response time or situation awareness. Every effort should be made to provide only the information necessary to perform the intended task. If a declutter option is considered the control of that function needs to be a top level function, not buried deep into a lower display menu. The offerors design needs to address this issue in their proposal to include a detailed design/descriptions for all integrated functions.

(8). Information overlaid on the FD and ND should be updated concurrently with the rest of the display to avoid “flashing” or other distracting appearances.

(9). The Capstone avionics equipment shall be FAA Parts Manufacturer Approval (PMA) or Technical Standard Order (TSO) in accordance with CFR 14 Part 21.303 or 21.601 respectively. All other Capstone avionics equipment shall be certified in accordance with CFR 14 Part 21 Subpart E.

(10). A special condition is necessary to ensure that each electrical and electronic system which performs critical functions is designed and installed so that the operation and operational capabilities of the system to perform critical functions are not adversely affected when the rotorcraft is exposed to high intensity radiated fields external to the airplane. The term "critical" means those functions whose failure would contribute to, or cause, a failure condition that would prevent the continued safe flight and landing of the rotorcraft. The critical function may be determined using the Functional Hazard Assessment (FHA) provided it is reviewed and approved by the FAA. The test levels are in Action Notice N8110.71: Guidance for the Certification of Aircraft Operating in High Intensity Radiated Field (HIRF) environments, dated April 2, 1998.

#### **d. NAVIGATION DISPLAY (ND) SYSTEM REQUIREMENTS – FIXED WING AIRCRAFT**

(1). The ND shall incorporate a TSO-C146 Class Gamma 2 GPS/WAAS Navigational System. The ND should be capable of displaying Navigation, Terrain, Obstacles, and Traffic, and Flight Information Services information. The display and information should comply with the following TSOs or equivalent:

TSO-C146	<b>Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).</b>
TSO-C113	Airborne Multipurpose Electronic Displays

(2). The ND shall have as a minimum, a VGA color display capable of at least 16 colors.

(3). The ND shall have a moving map display that is appropriate for intended function. It must be capable of Track up and North up, display geographic references, airports, airport surface maps, VORs, NDB, SUA, flight plan route, and current aircraft position.

(4). The ND Moving Map page should be able to display Traffic, Terrain and Navigational guidance information.

(5). The information displayed on the ND should be limited to key functionality. Display options should not add complexity.

(6). The scale of the moving map display shall be adjustable. As a minimum, the range shall be adjustable from 1 NM to 50 NM.

(7). The ND should display WAAS Horizontal Accuracy Level (HAL) consistent with Required Navigation Performance (RNP).

(8). The ND traffic and terrain portrayal is intended to give the pilot immediate traffic and terrain elevation and location awareness 360 degrees around the airplane.

#### **e. NAVIGATION DISPLAY (ND) SYSTEM REQUIREMENTS – ROTORCRAFT**

(1). Navigation Display (ND). The ND should be capable of displaying Navigation, Terrain, Obstacles, and Traffic, and Flight Information Services information. The display and information should comply with the following TSOs or equivalent:

TSO-C146	<b>Stand-Alone Airborne Navigation Equipment Using the Global Positioning System (GPS) Augmented by the Wide Area Augmentation System (WAAS).</b>
TSO-C113	Airborne Multipurpose Electronic Displays

(2). The ND shall as a minimum have a VGA color display capable of at least 16 colors.

(3). The ND shall have a moving map display that is appropriate for intended function. It must be capable of Track up and North up, display geographic references, airports, airport surface maps, VORs, NDB, SUA, flight plan route, and current aircraft position. The ND shall default to Track Up inflight.

(4). The ND Moving Map page should be able to display Traffic, Terrain and Navigational guidance information.

(5). The information displayed on the ND should be limited to key functionality. Display options should not add complexity. Soft keys should not be utilized.

(6). The scale of the moving map display shall be adjustable. As a minimum, the range shall be adjustable from 1 NM to 50 NM.

(7). The ND should be capable of displaying WAAS Horizontal Accuracy Level (HAL) consistent with Required Navigation Performance (RNP).

**f. FLIGHT DISPLAY (FD) SYSTEM REQUIREMENTS – FIXED-WING AIRCRAFT**

(1). The FD should be capable of displaying a forward-looking perspective view consisting of an integrated 3-D view of some type of lateral and vertical navigational guidance for the intended route, Terrain, Obstacles, and Traffic, and other primary flight information. The display and information should comply with the following TSOs or equivalent:

TSO-C2d	Airspeed Instruments
TSO-C4c	Bank and Pitch Instruments
TSO-C6d	Direction Instrument, Magnetic (Gyroscopically Stabilized)
TSO-C8d	Vertical Velocity Instruments (Rate-of-Climb)
TSO-C10b	Altimeter, Pressure Actuated, Sensitive Type
TSO-C113	Airborne Multipurpose Electronic Displays

(2). In addition to the basic Flight Display functions, the FD is expected to offer the pilot intuitive vertical and lateral flight path information to simplify the task of flying 3-dimensional paths while greatly enhancing pilot navigational performance. 3-D paths include VFR sightseeing tracks, IFR navigation, and eventually, flying precision approaches. The FD should be integrated with the Navigation Display. The FD must be able to present previously entered or “canned” flight routes and modified ND pilot-entered routes. Since the FD will display vertical guidance, a means to enter vertical profile information into the primary navigation system shall be provided via the ND, or other device.

(3). The FD shall provide the pilot additional situational awareness of terrain, water, obstacles, and runways in addition to the informational elements of conventional standard blue-sky/brown ground FDs. A clear, readily visible horizon line will probably be necessary to prevent attitude problems caused by only displaying terrain in the background.

(4). Design considerations shall be provided to accommodate periodic system upgrades.

(5). The represented field of view within the display needs to be appropriate for the given phase of flight. It is acceptable to use pilot selectable field of views if one field of view doesn’t work. Research has shown that for most phases, 40 degrees works well. Research has also demonstrated that during an approach a narrowing of the field of view might be beneficial. However, the degree to which this narrowing occurs will be influenced by the physical display size.

(6). Traffic Advisory and Conflict Detection System information should be integrated into the FD such that the pilot can rapidly locate traffic when going from “heads-down” to “heads-up” looking out the window. For this feature, display traffic information on the FD if



the range is less than 5 NM and within the field of view of the FD. Provisions should be made to provide a pilot with a manual override/declutter function.

(7). Terrain (TAWS) topographical features should be displayed on both the ND and FD. Preferably the terrain would be shaded to relate to the TAWS cautionary altitude and all terrain above the airplane.

(8). Motion of the FD must be fluid and reflect motion standards that currently exist for mechanical displays and electronic flight instrument systems. In general, fluid motion of terrain imagery is considered to occur at update rates of 20 to 30 Hz, and higher, and depend somewhat on the phase of flight and level of control activity (i.e. nominal cruise or landing/flare).

(9). The terrain elevation database used for the FD shall be created following well-documented procedures to establish a highly reliable and identified level of accuracy. The terrain elevation database shall be updated at an interval that assures the reliability of the information. The procedures used in developing the terrain elevation database and the update cycle of the database shall be stated in the offerors proposal. This can be the same database as the TAWS system uses or a stand-alone database. If the TAWS and FD databases are different, the differences should not be visibly detectable.

#### **g. FLIGHT DISPLAY (FD) SYSTEM REQUIREMENTS – ROTORCRAFT**

(1). The FD should be capable of displaying a forward-looking perspective view consisting of an integrated 3-D view of some type of lateral and vertical navigational guidance for the intended route, Terrain, Obstacles, and Traffic, and other essential flight information. The display and information should comply with the following TSOs or equivalent:

TSO-C2d	Airspeed Instruments
TSO-C4c	Bank and Pitch Instruments
TSO-C6d	Direction Instrument, Magnetic (Gyroscopically Stabilized)
TSO-C8d	Vertical Velocity Instruments (Rate-of-Climb)
TSO-C10b	Altimeter, Pressure Actuated, Sensitive Type
TSO-C113	Airborne Multipurpose Electronic Displays

(2). In addition to the basic flight display functions, the FD is expected to offer the pilot intuitive vertical and lateral flight path information to simplify the task of flying 3-dimensional paths while greatly enhancing pilot navigational performance. 3-D paths include VFR sightseeing tracks, IFR navigation, and eventually, flying precision approaches. The FD should be integrated with the navigation display. The FD must be able to present previously entered or “canned” flight routes and modified ND pilot-entered routes. Since the FD will display vertical guidance, a means to enter vertical profile information into the navigation system shall be provided via the ND, or other device.



(3). The FD shall provide the pilot additional situational awareness of terrain, water, obstacles, and runways in addition to standard blue-sky/brown ground FDs. A clear, readily visible horizon line will probably be necessary to prevent attitude problems caused by only displaying terrain in the background.

(4). Design considerations shall be provided to accommodate periodic system upgrades.

(5). The represented field of view within the display needs to be appropriate for the given phase of flight. It is acceptable to use pilot selectable field of views if one field of view doesn't work. Research has shown that for most phases, 40 degrees works well. Research has also demonstrated that during an approach a narrowing of the field of view might be beneficial, however, the degree to which this narrowing occurs will be influenced by the physical display size. A field of view area symbol or triangle corresponding to the current FD display should be shown on the navigation display. This will allow the pilot to see on the map what features are displayed in the FD.

(6). A desired feature is to integrate traffic into the FD such that the pilot can rapidly locate traffic when going from "heads-down" to "heads-up" looking out the window. For this feature, display traffic information on the FD if the range is less than 5 nm and within the field of view of the FD. Provisions should be made to provide a pilot with a manual override/declutter function.

(7). Terrain (TAWS) topographical features should be displayed. The ND terrain portrayal is intended to give the pilot immediate terrain elevation and location awareness 360 degrees around the rotorcraft. See HTAWS Terrain Map Colors in the Appendix for reference. In addition, the display must meet Class A display requirements even if the TAWS system is Class B.

(8). Motion of the FD must be fluid and reflect motion standards that currently exist for mechanical displays and EFIS systems. In general, fluid motion of terrain imagery is considered to occur at update rates of 20 to 30 Hz, and higher, and depend somewhat on the phase of flight and level of control activity (i.e. nominal cruise or landing/flare).

(9). The terrain elevation database used for the FD shall be created following well-documented procedures to establish a highly reliable and identified level of accuracy. The terrain elevation database shall be updated at an interval that assures the reliability of the information. The procedures used in developing the terrain elevation database and the update cycle of the database shall be stated in the offeror's proposal. This can be the same database as the TAWS system uses or a stand-alone database. If the TAWS and FD databases are different, the differences should not be visibly detectable.

(10). The software levels for the FD shall be Level A in order to meet IFR requirements.

### **C-3 SECONDARY GPS/WAAS NAVIGATOR**

- a. The offeror shall provide as a separate line item the cost of a secondary GPS/WAAS Navigator. A secondary GPS/WAAS Navigator may be required for some of the IFR installations on aircraft operating in accordance with 14 CFR Part 135.
- b. The secondary GPS/WAAS-based navigator shall meet the requirements of a Technical Standard Order (TSO)-C146, Functional Class Gamma Operations Class 2, with the exception that performance shall be based on the final draft of RTCA/DO-229C, dated May 17, 2001, in lieu of RTCA/DO-229B. For additional requirements for the rotorcraft equipment refer to Appendix Q of RTCA/DO-229C, dated May 17, 2001.
- c. The IFR navigation database, as a minimum, shall contain all enroute, terminal, and non-precision approach information for the State of Alaska. It is preferred that all the navigational information for Alaska should be on one data card. However, if the navigational information is on more than one card, the operator shall not be required to remove one card and insert another card during flight. This navigational information shall be capable of being updated.
- d. The offeror shall provide the IFR navigation database updates for the TSO-C146 Class Gamma 2 secondary GPS/WAAS Navigator for each aircraft equipped with Capstone avionics equipment until December 31, 2005. The navigational database shall be updated, as a minimum, on a 28-day cycle.
- e. The software level for a secondary GPS/WAAS based Navigator shall meet the appropriate level sought in the TSO and shall comply with RTCA Document No. RTCA/DO-178b.
- f. The secondary GPS/WAAS based navigation system shall meet the appropriate requirements of RTCA Document No. RTCA/DO-160D, Change 1, Environmental Conditions and Test Procedures for Airborne Equipment for the intended installation environment.

### **D-0 WARRANTY REQUIREMENTS**

Capstone equipment shall have a warranty for three years from the date of installation and or the date of receipt. See Part 1, Section I, Paragraph I-1. Warranty.

### **E-0 TRAINING REQUIREMENTS**

**E-1.** The successful offeror shall in cooperation with the University of Alaska Anchorage Aviation Technology Division, develop a training program on the operation of the Capstone avionics system. The University of Alaska Anchorage may also request assistance in developing a training program to address the installation of the Capstone avionics system.

**E-2.** The offeror shall provide as a separate line item the cost of a portable Capstone avionics system training device. The FAA may elect to either purchase or not purchase this equipment. This equipment shall also be available to the University of Alaska Anchorage Aviation Technology Division at the same cost offered to the FAA.

**E-3.** The successful offeror shall develop installation instructions for installation of the Capstone avionics system in the University of Alaska Anchorage Aviation Technology Division's simulator and training device.

**E-4.** The offeror shall provide, as a separate line item, the cost of an appropriate version of the Capstone avionics system to be installed in the Advanced General Aviation Research Simulator located at the Civil Aeromedical Institute (CAMI) in Oklahoma City, Oklahoma, for use in certification and human factors research. It is preferable that the avionics be delivered as a software package that will allow maintenance and upgrade of the displays as the program progresses. The cost estimate should include personnel support for integration of the avionics system with the simulator. Similarly, the offeror shall provide, as a separate line item, the cost of an appropriate version of the proposed Capstone avionics system to be installed in the NASA Langley Research Center General Aviation Flight Test Vehicle (Cessna 206) and/or the General Aviation WorkStation (GAWS) as a hot-bench application.

## **F-0 INSTALLATION REQUIREMENTS**

### **F-1. FIXED-WING AIRCRAFT**

a. The successful offeror shall provide written permission to each aircraft owner allowing use of the Supplemental Type Certificate for installation of the Capstone avionics equipment.

b. An estimated cost for installation of the Capstone avionics system shall be provided. In developing this estimate, assume the installations will be made in the Anchorage, Alaska, area and the equipment will be installed in a single-engine Cessna Model 206 airplane.

c. The offeror shall provide as a separate line item the cost of an installation kit for the Capstone avionics systems. This installation kit should include connectors, mounting racks, and required accessories.

d. The offeror shall provide installation manuals, operating manuals, and flight manual supplements with each Capstone avionics systems.

## **F-2. ROTORCRAFT**

- a. The successful offeror shall provide written permission to each aircraft owner allowing use of the Supplemental Type Certificate for installation of the Capstone avionics equipment.
- b. If the Capstone equipment interfaces or replaces existing IFR required systems, the helicopter will either be limited to VFR operations or recertified for IFR.
- c. An estimated cost for installation of the Capstone avionics system shall be provided. In developing this estimate, assume the installations will be made in the Anchorage, Alaska, area and the equipment estimate should be made for installation in a Eurocopter 350.
- d. The offeror shall provide as a separate line item the cost of an installation kit for the Capstone avionics system. This installation kit should include connectors, mounting racks, and required accessories.
- e. The offeror shall provide installation manuals, operating manuals, and flight manual supplements with each Capstone avionics system.

## **G-0 CERTIFICATION REQUIREMENTS**

### **G-1. FIXED-WING AIRCRAFT**

- a. The Capstone avionics equipment, except the ADS-B system, and installation of that equipment shall be certified in accordance with the applicable Federal Aviation Regulations (as referenced in the Statement of Work) not later than 120 days after the notification of contract award. The ADS-B system shall be certified in accordance with the applicable Federal Aviation Regulations not later than 180 days after the RTCA approves a MOPS for the UAT ADS-B system.
- b. The installation of the Capstone avionics system shall be certified in accordance with 14 CFR Part 21, Subpart E. The installation approval(s) shall be applicable for all the small airplanes to be equipped in the Capstone demonstration area. The installation shall be certified using the certification approach specified below in G-4. The installation shall be certified for IFR use for an airplane operating in accordance with 14 CFR Part 91.
- c. The offeror shall provide evidence of at least 3 years experience in the manufacturing and certification of aircraft avionics systems.

**Note:** For equipment not already certified, a certification plan must be submitted.

- d. The Certification Plan for fixed-wing aircraft shall include the following:

(1). A brief summary of the project, including information about the purpose of the project.

(2). Identification of the grouping of airplane models, for the Approved Model List Supplemental Type Certificate(s).

The following list includes, but is not limited to, the airplanes that may be participating in the Capstone Program. This list should be used as a guide in determining grouping for "Approved Model List" Supplemental Type Certificate(s):

Beech Models 200 Series, 1900 Series

Britten-Norman Model BN2 Series

Cessna Models 170 Series, 172 Series, 180 Series, 182 Series, 185 Series, 206 Series, 207 Series, 208 Series, 402 Series.

DeHavilland Models DHC-2 Series, DHC-3 Series, DHC-6 Series

Fairchild SA227 Series

Piper Models PA-28 Series, PA-32 Series, PA-31 Series, PA-34 Series.

(3). A comprehensive system description, including intended function of the equipment.

(4). Plan for Software Aspects Certification.

(5). A time-table listing the needed actions for certification.

(6). A certification matrix that identifies the applicable Federal Aviation Regulations, Advisory Circulars, current policies, certification basis, and the procedures or methods that will be used to comply with those regulations.

The following is guidance to be used in developing a certification plan:

The GPS navigation system shall be certified as an IFR navigation system. The equipment shall meet TSO-C146 requirements. The installation of the equipment shall be certified in accordance with Advisory Circular (AC) 20-138(A).

The level of certification for the software and environmental conditions is as stated previously in this statement of work.

The installation of the equipment will be approved by Supplemental Type Certificate (STC). The STC will use an approved make and model list to specify the airplanes that are approved for this modification. The task of installing the Capstone avionics system in the

number and variety of airplanes that Capstone proposes, in a cost effective manner, will require that a standard set of installation instructions and checkout procedures be developed for a multitude of similar airplanes. For example, different installation instructions may be required based on whether the airplane was pressurized or not. An "Approved Model List" STC would be issued to include all airplanes for which the installation instructions were applicable. These instructions will specify approved methods, techniques, and practices used to install the Capstone avionics package. Installation instructions should address the installation of all the equipment required for the Capstone avionics package (GPS Navigation System, ND, FD, other Capstone avionics equipment as required to perform the Capstone functions, and required antennas). The installation data will be a standard set of installation instructions and checkout procedures that are developed for each group of airplanes. A set of checkout procedures will be used to verify that the installed equipment functions as designed. These checkout procedures will verify that electrical load, electronic magnetic interferences, etc., meet the applicable requirements and a flight check will verify that all the IFR functions of the GPS Navigation System work correctly. Once the system functional test is complete, the airplane can be returned to service. After the installation, a FAA Approved Avionics Repair Station using FAA Form 337 will return the airplane to service.

## **G-2. ROTORCRAFT**

a. The Capstone avionics system equipment and installation of that equipment shall be certified in accordance with the applicable Federal Aviation Regulations (as referenced in the Statement of Work) not later than 120 days after the notification of contract award. The ADS-B system shall be certified in accordance with the applicable Federal Aviation Regulations not later than 180 days after the RTCA approves a MOPS for the UAT ADS-B system.

b. The installation of the Capstone avionics system shall be certified in accordance with 14 CFR Part 21, Subpart E. The installation approval(s) shall be applicable for all the rotorcraft to be equipped in the Capstone demonstration area. The offeror shall obtain a Supplemental Type Certificate (STC) approving the VFR installation of the Capstone avionics suite for each model of rotorcraft specified in A-1. The offeror shall also obtain a STC approving the IFR installation of the Capstone avionics suite in a Bell Model 212 helicopter.

c. The offeror shall provide evidence of at least 3 years experience in the manufacturing and certification of aircraft avionics systems.

d. The offeror shall provide a certification Plan for the Eurocopter AS 350 aircraft shall include the following (a certification plan will need to be developed for the full certification for each model listed in A-1):

(1). A brief summary of the project, including information about the purpose of the project.

(2). Identification of the rotorcraft series for which a Supplemental Type Certificate(s) will be issued.

The purpose of the AS 350 certification plan is to conduct the initial contract selection evaluation.

(3). A comprehensive system description, including intended function of the equipment.

(4). Functional Hazard Assessment

(5). Plan for Software Aspects Certification

(6). A time table listing the needed actions for certification.

(7). A certification matrix that identifies the applicable Federal Aviation Regulations, Advisory Circulars, current policies, certification basis, and the procedures or methods that will be used to comply with those regulations.

(8). A list of appropriate limitations and instructions for the Rotorcraft Flight Manual Supplement.

The following is guidance to be used in developing a certification plan:

The GPS navigation system shall be certified meeting IFR navigation performance requirements. The equipment shall meet TSO-C146 requirements. The installation of the equipment shall be certified in accordance with Advisory Circular (AC) 20-138(A).

The level of certification for the software and environmental conditions is as indicated in the previous requirements.

The installation of the equipment will be approved by Supplemental Type Certificate (STC). The STC will use an approved make and model list to specify the rotorcraft that are to be approved for this modification. To accomplish the task of installing the Capstone avionics system in the number and variety of rotorcraft that Capstone proposes, in a cost effective manner, will require that a standard set of installation instructions and checkout procedures be developed for a multitude of similar helicopters. An "Approved Series List" STC would be issued to include all rotorcraft for which the installation instructions were applicable. These instructions will specify approved methods, techniques, and practices used to install the Capstone avionics package. Installation instructions should address the installation of all the equipment required for the Capstone avionics package (GPS Navigation System, ND, other Capstone avionics equipment as required to perform the Capstone functions, and required antennas). The installation data will be a standard set of installation instructions and checkout procedures that are developed for each group of rotorcraft. A set of checkout procedures will be used to verify that the installed equipment functions as designed. These checkout procedures will verify that EMI, etc., meet the applicable requirements and a flight check will verify that all the functions of the GPS



navigation system work correctly. Once the system functional test is complete, the helicopter can be returned to service. After the installation, a FAA Approved Avionics Repair Station using FAA Form 337 will return the helicopter to service.

**Note:** Present FAA policy requires that an aircraft be under an experimental airworthiness certificate for all FAA flights to show compliance.

The certification of the Flight Display will follow the same approach as the Navigation Display.

## **H-0. OPERATIONAL DEMONSTRATION**

The offers will be down-selected to one prospective offeror. This offeror shall demonstrate, in ground and flight, the capabilities of its proposed avionics system. An operational flight demonstration of the proposed equipment will be required to verify equipment and functional specifications. That demonstration will require the offeror to provide at least two aircraft (one fixed wing and one helicopter that is listed in Section A.1) equipped with its Capstone avionics equipment. A demonstration plan must be developed to demonstrate the intended function of the equipment and an engineering simulator demonstration is preferred prior to flight. The operational flight demonstration is planned to occur in January 2002. The flight testing will be conducted in Juneau, Alaska. Following a successful flight demonstration, as determined by the FAA, the contract will be awarded.



## APPENDIX A FIXED-WING AIRCRAFT

### Small Airplane Deviations to TSO C-151a

Suggested deviations to TSO C-151a are provided below for voluntary TAWS installations on small airplane. For the purposes of these deviations, Small Airplane are defined to be turbine powered airplanes with six or less passenger seats, or reciprocating engine powered airplanes with nine or less passenger seats.

#### **II. Class B**

It is recommended that TAWS equipment designed for small airplane should meet all the requirements of a Class B TAWS with a programming or installation option for small airplane deviations. If the equipment is designed only to function as Class B for voluntary installations on small airplane, per these deviations, it should be appropriately marked such that it can be uniquely distinguished from the Class B TAWS required by FAR Parts 91 and 135.

#### ***A.A. Small Airplane Deviations to DO-161A***

No deviation – TAWS for Small Airplane are required to supply Modes 1 and 3 same as normal required Class B, Section 3.4, Class B Requirements for GPWS Alerting.

#### ***B.B. Small Airplane Deviations to TSO C-151a***

#### **Required Terrain Clearance (RTC) By Phase of Flight**

A deviation is taken to the RTC. The TERPS criteria need not apply to TAWS for small airplane flying that normally navigate visually. For ROC, selection of parameters more appropriate to low level visual flight is desired and reflected in the table below.

Alternate Table 3.1 is shown below.

**TABLE 3.1**

#### **TAWS REQUIRED TERRAIN CLEARANCE (RTC) BY PHASE OF FLIGHT**

Phase of Flight	Small Airplane ROC	TAWS (RTC) Level Flight	TAWS (RTC) Descending
Enroute	500 Feet	250 Feet	200 Feet
Approach	250 Feet	150 Feet	100 Feet
Departure (See Note 1)	48 Feet/NM	100 Feet	100 Feet

**Note 1:** During the Departure Phase of Flight, the Forward Looking Terrain Avoidance (FLTA) function must alert if the airplane is projected to be within 100 feet vertically of terrain. However the equipment should not alert if the airplane is projected to be more than 250 feet above the terrain.

**Voice Callouts** A deviation is taken to the normal 500 foot callout. (*Since 500 feet AGL is an approved flight altitude, this callout is inappropriate.*)

**Altitude Accuracy** A means shall be provided to compute actual MSL altitude and a Vertical Figure of Merit (VFOM). FLTA warning altitudes should compensate for estimated altitude errors.

### **Aural and Visual Alerts**

**TABLE 4 – 1**

<b>STANDARD SET OF VISUAL AND AURAL ALERTS</b>		
<b>Alert Condition</b>	<b>Caution</b>	<b>Warning</b>
Terrain Awareness Reduced Required Terrain Clearance	<b><u>Visual Alert</u></b> Amber text message that is obvious, concise, and must be consistent with the Aural message. <b><u>Aural Alert</u></b> Minimum Selectable Voice Alert: "Caution, Terrain; Caution, Terrain"	<b><u>Visual Alert</u></b> Red text message that is obvious, concise and must be consistent with the Aural message. <b><u>Aural Alert</u></b> Minimum Selectable Voice Alert: "Terrain Ahead; Terrain Ahead"
Terrain Awareness Imminent Impact with Terrain	<b><u>Visual Alert</u></b> Amber text message that is obvious, concise, and must be consistent with the Aural message. <b><u>Aural Alert</u></b> Minimum Selectable Voice Alert: "Caution, Terrain; Caution, Terrain"	<b><u>Visual Alert</u></b> Red text message that is obvious, concise and must be consistent with the Aural message. <b><u>Aural Alert</u></b> Minimum Selectable Voice Alert: "Terrain Ahead; Terrain Ahead"
Terrain Awareness Premature Descent Alert (PDA)	<b><u>Visual Alert</u></b> Amber text message that is obvious, concise and must be consistent with the Aural message. <b><u>Aural Alert</u></b> "Too Low; Too Low"	<b><u>Visual Alert</u></b> None Required <b><u>Aural Alert</u></b> None Required
Ground Proximity Excessive Descent Rate	<b><u>Visual Alert</u></b> Amber text message that is obvious, concise, and must be consistent with the Aural message. <b><u>Aural Alert</u></b> "Sink Rate"	<b><u>Visual Alert</u></b> Red text message that is obvious, concise and must be consistent with the Aural message. <b><u>Aural Alert</u></b> "Pull-Up"
Ground Proximity	<b><u>Visual Alert</u></b>	<b><u>Visual Alert</u></b>

Altitude Loss after Take-off	Amber text message that is obvious, concise, and must be consistent with the Aural message. <b>Aural Alert</b> "Don't Sink"	None Required. <b>Aural Alert</b> None Required.
Ground Proximity Voice Call Out (See Note 1)	<b>Visual Alert</b> None Required <b>Aural Alert</b> "Five Hundred"	<b>Visual Alert</b> None Required. <b>Aural Alert</b> None Required

**NOTE 1:** The aural alert for Ground Proximity Voice Call Out is considered advisory.

**NOTE 2:** Visual alerts may be put on the terrain situational awareness display, if this fits with the overall human factors alerting scheme for the flight deck. This does not eliminate the visual alert color requirements, even in the case of a monochromatic display. Typically in such a scenario adjacent colored enunciator lamps meet the alerting color requirements.

## II. Test Conditions

TSO Notes:

*Appendix 3, Section 1, Paragraph 1.1 in the TSO is not applicable; for small airplane only three phases of flight are considered, departure, enroute, & approach to landing.*

*Appendix 3, Section 1, Paragraph 1.2 in the TSO is changed to specify altitude levels, test speeds and pull-ups more appropriate to small airplane.*

1.2 Enroute Descent Requirements. A terrain alert shall be provided in time so as to assure that the airplane can level off (L/O) with a minimum of 200 feet altitude clearance over the terrain/obstacle when descending toward the terrain/obstacle at any speed within the operational flight envelope of the airplane. The test conditions assume a descent along a flight path that has terrain that is 500 feet below the expected level off altitude. If the pilot initiates the level off at the proper altitude, no TAWS alert would be expected. However, if the pilot is distracted or otherwise delays the level off, a TAWS alert is required to permit the pilot to recover to level flight in a safe manner.

a. See Table A Below. Column A represents the test condition. Columns B, C, and D are for information purposes only. Column E represents the Minimum Altitude for which TAWS alerts must be posted to perform their intended function. Column F represents the Maximum altitude for which TAWS alerts may be provided in order to meet the nuisance alert criteria. See TSO Appendix 3, Section 4.0.

b. For each of the Descent rates specified below, recovery to level flight at or above 200 feet terrain clearance is required.

c. Test Conditions for 1.2:

Assumed Pilot response time: 3.0 seconds minimum  
Assumed constant G pull-up: 1.0 g  
Minimum Allowed Terrain Clearance: 200 feet AGL  
Descent rates: 500, 1000, and 2000 fpm  
Assumed Pilot Task for Column F: Level off at 500 feet above the terrain per Appendix 1 Table 3–1 Required Obstacle Clearance (ROC).

**NOTE 1:** The actual values for the airplane altitude, distance and time from the terrain cell when caution and warning alerts are posted and the minimum terrain clearance altitude must be recorded.

**NOTE 2:** Enroute operations are considered to exist beyond 10 NM from the departure runway until 10 NM from the destination airport. Use of the nearest runway logic is permissible provided suitable logic is incorporated to ensure that the transitions to the terminal logic will typically occur only when the airplane is in terminal airspace.

**NOTE 3:** The values shown in column E may be reduced by 50 feet (to permit a level off to occur at 150 feet above the obstacle) provided that it can be demonstrated that the basic TAWS Mode 1 alert (sink rate) is issued at, or above, the altitude specified in column E for typical terrain topographies.

**NOTE 4:** The values shown in Column F are appropriate for an airplane without an Autopilot or Flight Director function, and are based upon 10-15 percent of the vertical velocity which is appropriate to manual flight and small general aviation airplane operations.

TABLE A

Enroute Descent Alerting Criteria					
A	B	C	D	E	F
VERT SPEED (FPM)	ALT LOST WITH 3 SEC PILOT DELAY	ALT REQ'D TO L/O WITH 1 G PULLUP	TOTAL ALT LOST DUE TO RECOVERY MANEUVER	MINIMUM TAWS WARNING ALERT HEIGHT (ABOVE TERRAIN)	MAXIMUM CAUTION ALERT HEIGHT (ABOVE TERRAIN)
500	25	1	26	226	550
1000	50	4	54	254	600
2000	100	17	117	317	800

*TSO Note:*

*Appendix 3, Section 1, Paragraph 1.3 in the TSO is changed to specify altitude levels, test speeds and pull-ups more appropriate to small airplane:*

**1.3 Enroute Level Flight Requirement.** During level flight operations (vertical speed is  $\pm$  200 feet per minute), a terrain alert should be posted when the airplane is within 250 feet of the terrain and is predicted to be equal to or less than 200 feet within the prescribed alerting time or distance. See Table B below for Test Criteria.

**NOTE 1:** The actual values for the airplane altitude, distance and time from the terrain cell when caution and warning alerts are posted must be recorded.

TABLE B

Enroute Level Flight Alerting Criteria			
GROUND SPEED (KT)	HEIGHT OF TERRAIN CELL (MSL)	TEST RUN ALTITUDE (MSL)	ALERT CRITERIA
100	5000	5350	NO ALERT
150	5000	5350	NO ALERT
200	5000	5350	NO ALERT
100	5000	5240 (+0/-50)	MUST ALERT
150	5000	5240 (+0/-50)	MUST ALERT
200	5000	5240 (+0/-50)	MUST ALERT

TSO Notes:

*Appendix A, Section 1, Paragraphs 1.4 & 1.5 in the TSO are not applicable.*

*Appendix A, Section 1, Paragraph 1.6 in the TSO is changed to specify altitude levels, test speeds and pull-ups more appropriate to small airplane:*

**1.6 Final Approach Descent Requirements.** A terrain alert shall be provided in time so as to assure that the airplane can level off (L/O) with a minimum of 100 feet altitude clearance over the terrain/obstacle when descending toward the terrain/obstacle at any speed within the operational flight envelope of the airplane.

a. See Table E Below. Column A represents the test condition. Columns B, C, and D are for information purposes only. Column E represents the Minimum Altitude for which TAWS alerts must be posted to perform their intended function. Column F represents the Maximum altitude for which TAWS alerts may be provided in order to meet the nuisance alert criteria. See Appendix 3, Section 4.0

b. For each of the Descent rates specified below, recovery to level flight at or above 100 feet terrain clearance is required.

c. Test Conditions for 1.6:

Assumed Pilot response time: 1.0 seconds minimum  
Assumed constant G pull-up: 1.0 g  
Minimum Allowed Terrain Clearance: 100 feet AGL  
Descent rates: 500, 750, and 1000 fpm  
Assumed Pilot Task for Column F: Level off at 250 feet above the terrain per Appendix 1 Table 3–1 Required Obstacle Clearance (ROC).

**NOTE 1:** The actual values for the airplane altitude, distance and time from the terrain cell when caution and warning alerts are posted and the minimum terrain clearance altitude must be recorded.

**NOTE 2:** The values shown in Column F are appropriate for an airplane without an Autopilot or Flight Director function, and are based upon 10 percent of the vertical velocity which is appropriate to manual flight and small general aviation airplane operations.

TABLE E

Approach Descent Alerting Criteria					
A	B	C	D	E	F
VERT SPEED (FPM)	ALT LOST WITH 1 SEC PILOT DELAY	ALT REQ'D TO L/O WITH 1 G PULLUP	TOTAL ALT LOST DUE TO RECOVERY MANEUVER	MINIMUM TAWS WARNING ALERT HEIGHT (ABOVE TERRAIN)	MAXIMUM CAUTION ALERT HEIGHT (ABOVE TERRAIN)
500	8	1	9	109	300
750	12	2	14	114	325
1000	17	4	21	121	350

TSO Notes:

*Paragraph 1.7 applies as written.*

*Paragraphs 2.0 thru 2.2 apply using Table G for speed cases of 100 thru 250 knots, however change the incremental pull from 0.25 to 1.0g in Note 2.*

*Paragraph 3.0 and 3.1 apply as written.*

*Paragraph 4.0 applies with 4.1 excluded. 4.2 and 4.3 are modified as follows.*

4.2 2000FPM. It must be possible to descend at 2000 FPM and level off 500 feet above the terrain using a normal level off procedure (leading the level off by 10 percent of the vertical speed), without a caution or warning alert.

4.3 1000FPM. It must be possible to descend at 1000 FPM in the Final Approach Segment and level off at 250 feet using the normal level off procedure described in 4.2 above, without a caution or warning alert.

Paragraph 5.0 and 5.1 are applicable as written, however, test cases are limited to 3, 6, 7, & 8 in Table I.

Paragraphs 6.0 through 6.3 are to be determined by the applicant using actual NTSB GA accidents. Since detailed data is usually not available, reasonable constructed scenarios matching the actual known accident data may be demonstrated. Pull of up to 1.0g may be used instead of the 0.25g as specified

Paragraphs 7.0 and 8.0 apply as written.

Paragraph 9.0 applies as written.

END OF APPENDIX A

## APPENDIX B ROTORCRAFT

Suggested deviations to TSO C-151a are provided below for helicopters. Items that are commentary only are italicized. Reference Draft "Helicopter Terrain Awareness Warning System (HTAWS) Advisory Circular concerning installation and airworthiness criteria approval for FAR Part 27 and 29 rotorcraft.

### **III.I. Class A**

#### **A.A. Additional Considerations to DO-161**

##### **Mode 1**

A Helicopter Class A TAWS should provide an Excessive Descent Rate warning within a minimum of 12 seconds of impact with terrain. Provision shall be made to prevent nuisance warnings during a normal approach and during autorotation.

##### **Mode 2**

A Helicopter Class A TAWS should provide an Excessive Closure Rate to Terrain warning within a minimum of 8 seconds of impact with terrain. The system shall provide a reduced nuisance free warning when in a landing flight profile. Provision shall be made to prevent nuisance warnings during day VFR Low Altitude flying.

##### **Mode 3**

A Helicopter Class A TAWS should provide a warning of Excessive Altitude Loss during Takeoff. A warning shall be generated if the aircraft losses more than 40% of it's terrain clearance during takeoff. Takeoff is defined as at least the first 60 seconds of flights when greater than 60 knots and AGL above 100 feet.

##### **Mode 4**

A Helicopter Class A TAWS should provide a warning of Insufficient Terrain Clearance when not in a landing configuration (Gear Up) by 150 feet AGL for retractable gear aircraft. For fixed gear aircraft a warning of Insufficient Terrain Clearance when not at landing speeds shall be provided by 100 feet AGL. During an autorotation, improper landing gear configuration warnings should be provided by 400 feet AGL.

**Mode 5** No change is necessary for Mode 5.

#### **B.B. Helicopter Additions/Replacements to TSO C-151a**

##### **Required Terrain Clearance (RTC) By Phase of Flight**

Alternate Table 3.1 is shown below.



TABLE 3.1

TAWS REQUIRED TERRAIN CLEARANCE (RTC) BY PHASE OF FLIGHT

Phase of Flight	TERPS (ROC)	TAWS (RTC) Level Flight	TAWS (RTC) Descending
Enroute	1000 Feet	150 Feet	100 Feet
Terminal (Intermediate Segment)	500 Feet	150 Feet	100 Feet
Approach	250 Feet	150 Feet	100 Feet
Departure (See Note 1)	48 Feet/NM	100 Feet	100 Feet

Note 1: During the Departure Phase of Flight, the FLTA function of Class A and B equipment must alert if the aircraft is projected to be within 100 feet vertically of terrain. However Class A and Class B equipment should not alert if the aircraft is projected to be more than 150 feet above the terrain.

**TERRAIN AWARENESS DISPLAY**

Two display formats are supported: the standard display, and an optional “Peaks” mode display. In standard display format, the EGPWS provides display of **proximate** terrain. The display is color- and intensity-coded (by density) to provide visual indication of the **relative vertical distance between the aircraft and the terrain**. The color bands are as shown in Figure 18:

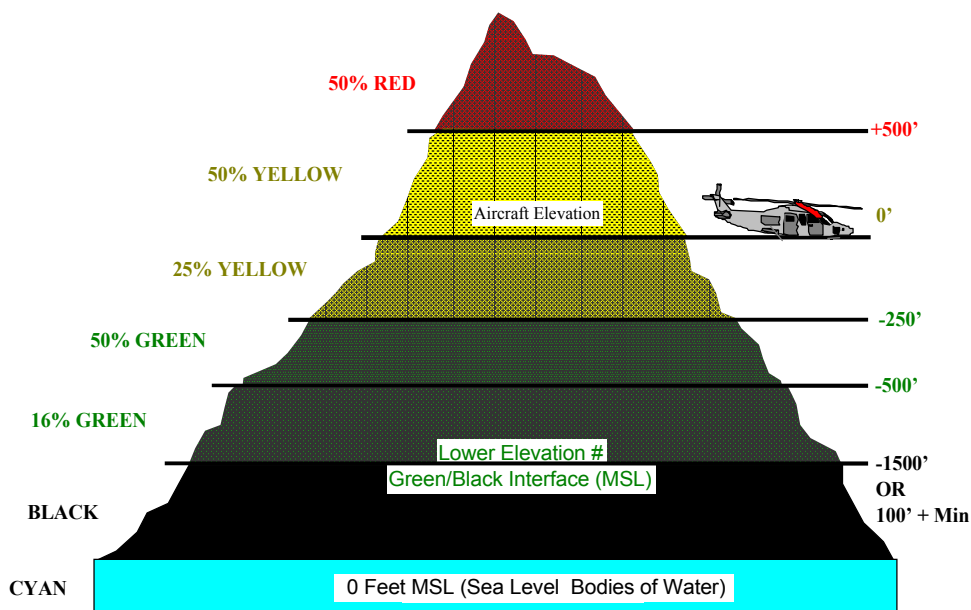


Figure 1: PEAKS DISPLAY COLOR BANDING

In “Peaks” display format, the EGPWS provides additional terrain display features for enhanced situational awareness, independent of the aircraft’s altitude. This function is evidenced by the presence of three-digit elevation numbers indicating the highest and lowest terrain/obstacle elevation within the selected map range, the display of additional green terrain contours when well above the terrain, and a distinct graphic representation of shore lines and sea level water (0 feet MSL) when supported by the display. These numbers are typically located in a corner of the display with the highest elevation number displayed above the lowest. The colors of the elevation numbers match the color of the terrain that is represented. These elevations are expressed in hundreds of feet above sea level (e.g., 125 is 12,500 feet MSL). In the event that there is no appreciable difference between the highest and lowest terrain/obstacle elevations (flat terrain), only the highest value is displayed.

With Peaks, additional color bands are provided as indicated by the shaded areas in the following table:

Color	Indication
Solid Red	Terrain/Obstacle Threat Area – Warning.
Solid Yellow	Terrain/Obstacle Threat Area – Caution.
50% Red Dots	Terrain/Obstacle that is more than 500 feet above aircraft altitude.
50% Yellow Dots	Terrain/Obstacle that is between aircraft altitude and 500 feet above aircraft altitude.
25% Yellow Dots	Terrain/Obstacle that is between aircraft altitude and 250 feet below aircraft altitude.
Solid Green (Peaks only)	Shown only when no Red or Yellow terrain/Obstacle areas are within range on the display. Highest terrain/Obstacle not within 500 feet of aircraft altitude.
50% Green Dots	Terrain/Obstacle that is 250 feet below to 500 feet below aircraft altitude.
(Peaks only)	Terrain/Obstacle that is the middle elevation band when there is no Red or Yellow terrain areas within range on the display.
16% Green Dots	Terrain/Obstacle that is 500 to 1500 feet below aircraft altitude.
(Peaks only)	Terrain/Obstacle that is the lower elevation band when there is no Red or Yellow terrain areas within range on the display.
Black	No significant terrain/Obstacle.
16% Cyan (Peaks only)	Sea level bodies of water.
Magenta Dots	Unknown terrain. No terrain data in the database for the magenta area shown.

### **Premature Descent Alert (PDA)**

*Since helicopters can land anywhere, the PDA is inappropriate.*

### **Voice Callouts**

*Since 500 feet AGL is a normal helicopter flight altitude, this callout is inappropriate.*

**Altitude Accuracy** A new requirement is proposed.

A means shall be provided to compute actual MSL altitude and a Vertical Figure of Merit (VFOM). FLTA warning altitudes should compensate for estimated altitude errors.

**Aural and Visual Alerts** An addition to Table 4.1 is proposed.

Add the message “**Warning Terrain**” to Warning Aural Alert messages for Reduced Required Terrain Clearance and Imminent Impact with Terrain.

**Low Altitude Mode** A new helicopter requirement is proposed.

A means shall be provided to manually select a reduced sensitivity state for Low Altitude and High Density Metropolitan operation.

## **IV.II. Class B**

### **A.A. Helicopter Additions/Replacements to DO-161A**

#### **Mode 1**

*Mode 1 is not a significant component of Helicopter CFIT accident history. Because of the complexity of Autorotation detection, Mode 1 should not be required for Class B helicopter equipment.*

#### **Mode 3**

*Adequate coverage for inadvertent descent after takeoff should be provided by the FLTA function, or other Mode 3 algorithm that prevents CFIT during takeoff. Takeoff is defined as at least the first 60 seconds of flights when greater than 60 knots and AGL above 100 feet.*

### **B.B. Helicopter Additions/Replacements to TSO C-151a**

**Voice Callouts:** Since 500 feet AGL is a normal helicopter flight altitude, this callout is inappropriate

## **V.III. Test Conditions**

Exclude paragraphs 1.1 thru 1.6. as not applicable.

Paragraph 1.7 applies as written.

Paragraphs 2.0 thru 2.2 apply using Table G for speed cases of 100 thru 160 knots.

Paragraph 3.0 and 3.1 are excluded as not applicable.

Paragraph 4.0, 4.2 and 4.3 apply as written. Case 4.1 is excluded as not applicable.

Paragraph 5.0 and 5.1 are applicable as written.

Paragraph 6.0 thru 6.3 are TBD.

Paragraphs 7.0, 8.0 and 9.0 are excluded as described above in sections 2.1 and 2.2.

**END OF APPENDIX B**

**PART I - SECTION E**  
**INSPECTION AND ACCEPTANCE**

**3.1-1 Clauses and Provisions Incorporated by Reference (June 1999)**

This screening information request (SIR) or contract, as applicable, incorporates by reference one or more provisions or clauses listed below with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make the full text available, or offerors and contractors may obtain the full text via Internet at: <http://fast.faa.gov> (on this web page, select "toolsets", then "procurement toolbox").

**3.10.4-2 Inspection of Supplies--Fixed-Price (November 1997)**

**End of Section**

**PART I - SECTION F  
DELIVERIES OR PERFORMANCE**

**3.1-1 Clauses and Provisions Incorporated by Reference (June 1999)**

This screening information request (SIR) or contract, as applicable, incorporates by reference one or more provisions or clauses listed below with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make the full text available, or offerors and contractors may obtain the full text via Internet at: <http://fast.faa.gov> (on this web page, select "toolsets", then "procurement toolbox").

**3.10.1-9 Stop-Work Order (October 1996)**

**3.10.1-11 Government Delay of Work (April 1996)**

\* \* \* \* \*

**3.2.2.7-1 Qualification Requirements (April 1996)**

(a) Definition: 'Qualification requirement,' as used in this clause, means a Government requirement for testing or other quality assurance demonstration that must be completed before award.

(b) One or more qualification requirements apply to the supplies or services covered by this contract. For those supplies or services requiring qualification, whether the covered product or service is an end item under this contract or simply a component of an end item, the product, manufacturer, or source must have demonstrated that it meets the standards prescribed for qualification before award of this contract. The product, manufacturer, or source must be qualified at the time of award whether or not the name of the product, manufacturer, or source is actually included on a qualified products list, qualified manufacturers list, or qualified bidders list. Offerors should contact the agency activity designated below to obtain all requirements that they or their products or services, or their subcontractors or their products or services, must satisfy to become qualified and to arrange for an opportunity to demonstrate their abilities to meet the standards specified for qualification.

FAA ALASKAN REGION      KARLA W. SHAW, CONTRACTING OFFICER  
(Agency Name and Contact)  
AAL-59A 222 WEST 7TH AVENUE, #14 ANCHORAGE, AK 99513  
(907) 271-5859  
(Address)

(c) If an offeror, manufacturer, source, product or service covered by a qualification requirement has already met the standards specified, the relevant information noted below should be provided.

Offerors Name \_\_\_\_\_  
Manufacturer's Name \_\_\_\_\_  
Source's Name \_\_\_\_\_  
Item Name \_\_\_\_\_  
Service Identification \_\_\_\_\_  
Test Number \_\_\_\_\_  
(to the extent known) \_\_\_\_\_

(d) Even though a product or service subject to a qualification requirement is not itself an end item under this contract, the product, manufacturer, or source must nevertheless be qualified at the time of award of this contract. This is necessary whether the Contractor or a subcontractor will ultimately provide the product or service in question. If, after award, the Contracting Officer discovers that an applicable qualification requirement was not in fact met at the time of award, the Contracting Officer may either terminate this contract for default or allow performance to continue if adequate consideration is offered and the action is determined to be otherwise in the Government's best interests.

(e) If an offeror, manufacturer, source, product, or service has met the qualification requirement but is not yet on a qualified products list or qualified vendors list, the offeror shall submit evidence of qualification prior to award of this contract. Unless determined to be in the Government's interest, award of this contract shall not be delayed to permit an offeror to submit evidence of qualification.

(f) Any change in location or ownership of the plant where a previously qualified product or service was manufactured or performed requires reevaluation of the qualification. Similarly, any change in location or ownership of a previously qualified manufacturer or source requires reevaluation of the qualification. The reevaluation must be accomplished before the date of award.

(End of clause)

**3.2.2.8-6 Time of Delivery** (November 1997)

(a) The Government requires delivery to be made according to the following schedule:

**REQUIRED DELIVERY SCHEDULE**

---

ITEM NO.	QUANTITY	WITHIN DAYS AFTER DATE OF CONTRACT
<u>1. AVIONICS SYSTEMS</u>	<u>20 UNITS</u>	<u>180 Days</u>

THE BALANCE OF THE AVIONICS SYSTEMS SHALL BE DELIVERED IN 35 UNIT INCREMENTS, EVERY 30 DAYS THEREAFTER, UNTIL ALL UNITS ORDERED HAVE BEEN DELIVERED.

ITEM NO.	QUANTITY	WITHIN DAYS AFTER DATE OF CONTRACT
<u>2. INSTALLATION KITS</u>	<u>20 UNITS</u>	<u>180 DAYS</u>

THE BALANCE OF THE INSTALLATION KITS SHALL BE DELIVERED IN 35 UNIT INCREMENTS, EVERY 30 DAYS THEREAFTER, UNTIL ALL UNITS ORDERED HAVE BEEN DELIVERED.

<u>3. SUBSCRIPTIONS FOR NAVIGATIONAL DATABASE</u>	<u>20 UNITS</u>	<u>180 DAYS</u>
---	-----------------	-----------------

THE BALANCE OF THE SUBSCRIPTIONS FOR THE NAVIGATIONAL DATABASE SHALL BE DELIVERED IN 35 UNIT INCREMENTS, EVERY 30 DAYS THEREAFTER, UNTIL ALL UNITS ORDERED HAVE BEEN DELIVERED.

<u>4. SUBSCRIPTIONS FOR OBSTRUCTION DATABASE</u>	<u>20 UNITS</u>	<u>180 DAYS</u>
--	-----------------	-----------------

THE BALANCE OF THE SUBSCRIPTIONS FOR THE NAVIGATIONAL DATABASE SHALL BE DELIVERED IN 35 UNIT INCREMENTS, EVERY 30 DAYS THEREAFTER, UNTIL ALL UNITS ORDERED HAVE BEEN DELIVERED.

<u>5. SUBSCRIPTIONS FOR TERRAIN DATABASE</u>	<u>20 UNITS</u>	<u>180 DAYS</u>
--	-----------------	-----------------

THE BALANCE OF THE SUBSCRIPTIONS FOR THE TERRAIN DATABASE SHALL BE DELIVERED IN 35 UNIT INCREMENTS, EVERY 30 DAYS THEREAFTER, UNTIL ALL UNITS ORDERED HAVE BEEN DELIVERED.

**6. (CLIN 7) AVIONICS EQUIPMENT**

TRAINING DEVICE                      1 UNIT                      120 DAYS

THE BALANCE OF THE AVIONICS EQUIPMENT TRAINING DEVICES (3) WILL BE DELIVERED UPON NOTIFICATION FROM THE CONTRACTING OFFICER.

**NOTE:** CLIN No.'s. 1.d. & 2.d. Secondary GPS/WAAS Navigator, 6. Subscriptions for the Secondary GPS/WAAS Navigator, 8. and 9. Avionics Equipment Research Simulator, and 10. Training Assistance to UAA. will not have specific delivery dates assigned to them. They will be delivered upon notification from the Contracting Officer.

The Government will evaluate equally, as regards time of delivery, offers that propose delivery of each quantity within the applicable delivery period specified above. Offers that propose delivery that will not clearly fall within the applicable required delivery period specified above, may be rejected. The Government reserves the right to award under either the required delivery schedule or the proposed delivery schedule, when an offeror offers an earlier delivery schedule than required above. If the offeror proposes no other delivery schedule, the required delivery schedule above will apply.

OFFEROR'S PROPOSED DELIVERY SCHEDULE

ITEM NO.	QUANTITY	WITHIN DAYS AFTER DATE OF CONTRACT
----------	----------	---------------------------------------

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

(b) Attention is directed to provisions of the screening information request/contract that provide that a written award or acceptance of offer mailed, or otherwise furnished to the successful offeror, results in a binding contract. The Government will mail or otherwise furnish to the offeror an award or notice of award not later than the day award is dated. Therefore, the offeror should compute the time available for performance beginning with the actual date of award, rather than the date the written notice of award is received from the Contracting Officer through the ordinary mails. However, the Government will evaluate an offer that proposes delivery based on the Contractor's date of receipt of the contract or notice of award by adding (i) five calendar days for delivery of the award through the ordinary mails, or (ii) one working day if the solicitation states that the contract or notice of



award will be transmitted electronically. (The term 'working day' excludes weekends and U.S. Federal holidays.) If, as so computed, the offered delivery date is later than the required delivery date, the offer may be rejected.

(End of clause)

**END OF SECTION**

**PART I - SECTION G**  
**CONTRACT ADMINISTRATION DATA**

**3.10.1-22 Contracting Officer's Technical Representative (July 1996)**

(a) The Contracting Officer may designate other Government personnel (known as the Contracting Officer's Technical Representative) to act as his or her authorized representative for contract administration functions which do not involve changes to the scope, price, schedule, or terms and conditions of the Contract. The designation will be in writing, signed by the Contracting Officer, and will set forth the authorities and limitations of the representative(s) under the Contract. Such designation will not contain authority to sign contractual documents, order contract changes, modify contract terms, or create any commitment or liability on the part of the Government different from that set forth in the Contract.

(b) The Contractor shall immediately contact the Contracting Officer if there is any question regarding the authority of an individual to act on behalf of the Contracting Officer under this Contract.

(End of Clause)

**G-1 TRAVEL**

The Contractor may be required to travel to Anchorage to provide assistance to the University of Alaska Anchorage in developing a training program on the operation of the Capstone avionics system and to address the installation of the avionics systems. See the Statement of Work, Paragraph E-1. All travel will be coordinated with the Contracting Officer, prior to the travel taking place. Actual costs incurred will be paid for travel and subsistence to the extent they do not exceed on a daily basis the maximum per diem rates in effect at the time of travel. The Contractor will be required to submit certified copies of all receipts to support the expenses incurred.

**END OF SECTION**

**PART II - SECTION I**  
**CONTRACT CLAUSES**

**3.1-1 Clauses and Provisions Incorporated by Reference (June 1999)**

This screening information request (SIR) or contract, as applicable, incorporates by reference one or more provisions or clauses listed below with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make the full text available, or offerors and contractors may obtain the full text via Internet at: <http://fast.faa.gov> (on this web page, select "toolsets", then "procurement toolbox").

**3.2.2.3-1 False Statements in Offers (April 1996)**

**3.2.2.3-29 Integrity of Unit Prices (April 1996)**

**3.2.2.3-33 Order of Precedence (January 1999)**

**3.2.2.7-6 Protecting the Government's Interest when Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment (April 1996)**

**3.2.5-1 Officials Not to Benefit (April 1996)**

**3.2.5-3 Gratuities or Gifts (January 1999)**

**3.2.5-4 Contingent Fees (October 1996)**

**3.2.5-5 Anti-Kickback Procedures (October 1996)**

**3.2.5-8 Whistleblower Protection for Contractor Employees (April 1996)**

**3.2.5-11 Drug Free Workplace (April 1996)**

**3.3.1-1 Payments (April 1996)**

**3.3.1-6 Discounts for Prompt Payment (April 1996)**

**3.3.1-8 Extras (April 1996)**

**3.3.1-9 Interest (April 1996)**

**3.3.1-15 Assignment of Claims (April 1996)**

**3.3.1-25 Mandatory Information for Electronic Funds Transfer (EFT) Payment - Central Contractor Registration (CCR) (June 2001)**

**Section I Contract Clauses cont'd**

- 3.4.2-8 Federal, State, and Local Taxes--Fixed Price Contract** (April 1996)
- 3.6.2-4 Walsh-Healey Public Contracts Act** (April 1996)
- 3.6.2-9 Equal Opportunity** (August 1998)
- 3.6.2-12 Affirmative Action for Special Disabled and Vietnam Era Veterans** (January 1998)
- 3.6.2-13 Affirmative Action for Workers With Disabilities** (April 2000)
- 3.6.2-14 Employment Reports on Special Disabled Veterans and Veterans of Vietnam Era** (January 1998)
- 3.6.3-2 Clean Air and Clean Water** (April 1996)
- 3.6.3-10 Certification of Toxic Chemical Release Reporting** (August 1998)
- 3.6.4-2 Buy American Act--Supplies** (July 1996)
- 3.10.1-7 Bankruptcy** (April 1996)
- 3.10.1-12 Changes--Fixed-Price** (April 1996)
- 3.10.6-1 Termination for Convenience of the Government (Fixed Price)** (October 1996)
- 3.10.6-4 Default (Fixed-Price Supply and Service)** (October 1996)

\* \* \* \* \*

**I-1. WARRANTY**

(a) Definitions.

"Acceptance," as used in this clause, means the act of an authorized representative of the FAA by which the FAA assumes for itself, or as an agent of another, ownership of existing supplies, or approves specific services as partial or complete performance of the contract.

"Correction" or "correct," as used in this clause, means the elimination of a defect.

"Supplies," as used in this clause, means the end items furnished by the Contractor and related services required under the contract.

(b) Contractor's obligations. (1) Notwithstanding inspection and acceptance by the FAA of supplies furnished under this contract, or any condition of the contract, the contractor warrants that

(A) for a period of three years from the date of installation with respect to the materials and manufacture of the Avionics Systems and Installation Kits; and

(B) for a period of three years from the date of receipt with respect to the materials and manufacture of the Avionics Equipment Training Simulators and the Avionics Equipment Research Simulators; and

(C) for a period of three years with respect to the work performed by the contractor to install any avionics systems that may be elected under this contract -

(i) All supplies furnished under this contract will be free from defects in material or workmanship and will conform with all requirements of this contract; and

(ii) The preservation, packaging, packing, and marking, and the preparation for, and method of, shipment of such supplies will conform with the requirements of this contract.

(2) When return, correction, or replacement is required, transportation charges and responsibility for the supplies while in transit shall be borne by the Contractor. However, the Contractor's liability for the transportation charges shall not exceed an amount equal to the cost of transportation by the usual commercial method of shipment between the place of delivery specified in this contract and the Contractor's plant, and return.

(3) Any supplies or parts thereof, corrected or furnished in replacement under this clause, shall be covered under the warranty of its original effective date, which is the date of installation and or the date of receipt of the equipment. The warranty will not restart when equipment is repaired or replaced. The remaining unexpired term of the warranty remains after a repair or a replacement.

(4) All implied warranties of merchantability and "fitness for a particular purpose" are excluded from any obligation contained in this contract.

(c) Remedies available to the FAA. (1) The Contracting Officer shall give written notice to the Contractor of any breach of warranties in paragraph (b)(1) of this clause within 30 days after discovery of the defect.

(2) Within a reasonable time after the notice, the Contracting Officer may either -

(i) Require, by written notice, the prompt correction or replacement of any supplies or parts thereof (including preservation, packaging, packing, and marking) that do not conform with the requirements of the contract within the meaning of paragraph (b)(1) of this clause; or

(ii) Retain such supplies and reduce the contract price by an amount equitable under the circumstances.

(3)(i) The Contracting Officer may, by contract or otherwise, correct or replace the nonconforming supplies with similar supplies from another source and charge to the Contractor the cost occasioned to the Government thereby if the Contractor -

(A) Fails to make redelivery of the corrected or replaced supplies within the time established for their return; or

(B) Fails either to accept return of the nonconforming supplies or fails to make progress after their return to correct or replace them so as to endanger performance of the delivery schedule, and in either of these circumstances does not cure such failure within a period of 10 days (or such longer period as the Contracting Officer may authorize in writing) after receipt of notice from the Contracting Officer specifying such failure.

(ii) Instead of correction or replacement by the FAA, the Contracting Officer may require an equitable adjustment of the contract price. In addition, if the Contractor fails to furnish timely disposition instructions, the Contracting Officer may dispose of the nonconforming supplies for the Contractor's account in a reasonable manner. The FAA is entitled to reimbursement from the Contractor, or from the proceeds of such disposal, for the reasonable expenses of the care and disposition of the nonconforming supplies, as well as for excess costs incurred or to be incurred.

(4) The rights and remedies of the FAA provided in this clause are in addition to and do not limit any rights afforded to the FAA by any other clause of this contract.

(End of Clause)

### **3.3.1-10 Availability of Funds (April 1996)**

Funds are not presently available for this contract. The FAA's obligation under this contract is contingent upon the availability of appropriated funds from which payment for contract purposes can be made. No legal liability on the part of the FAA for any payment may arise until funds are made available to the Contracting Officer for this contract and until the Contractor receives notice of such availability, to be confirmed in writing by the Contracting Officer.

(End of Clause)

### **3.6.3-11 Toxic Chemical Release Reporting (August 1998)**

(a) Unless otherwise exempt, the Contractor, as owner or operator of a facility used in the performance of this contract, shall file by July 1 for the prior calendar year an annual Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023(a) and (g)), and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106). The Contractor shall file, for each facility subject to the Form R filing and reporting requirements, the annual Form R throughout the life of the contract.

(b) A Contractor owned or operated facility used in the performance of this contract is exempt from the requirement to file an annual Form R if--

(1) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

(2) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

(3) The facility does not meet the reporting thresholds of toxic chemicals established under section 313(f) of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

(4) The facility does not fall within Standard Industrial Classification Code (SIC) designations 20 through 39 or;

(5) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(c) If the Contractor has certified to an exemption in accordance with one or more of the criteria in paragraph (b) of this clause, and after award of the contract circumstances change so that any of its owned or operated facilities used in the performance of this contract is no longer exempt--

(1) The Contractor shall notify the Contracting Officer; and

(2) The Contractor, as owner or operator of a facility used in the performance of this contract that is no longer exempt, shall--

(i) Submit a Toxic Chemical Release Inventory Form (Form R) on or before July 1 for the prior calendar year during which the facility becomes eligible; and

(ii) Continue to file the annual Form R for the life of the contract for such facility.

(d) The Contracting Officer may terminate this contract or take other action as appropriate, if the Contractor fails to comply accurately and fully with the EPCRA and PPA toxic chemical release filing and reporting requirements.

(e) Except for acquisitions of commercial items shall--

(1) For competitive subcontracts expected to exceed \$100,000 (including all options), include a solicitation provision substantially the same as the provision entitled Certification of Toxic Chemical Release Reporting; and

(2) Include in any resultant subcontract exceeding \$100,000 (including all options), the substance of this clause, except this paragraph (e).

(End of clause)

### **3.9.1-1 Contract Disputes (August 1999)**

(a) All contract disputes arising under or related to this contract shall be resolved through the Federal Aviation Administration (FAA) dispute resolution system at the Office of Dispute Resolution for Acquisition (ODRA) and shall be governed by the procedures set forth in 14 C.F.R. Parts 14 and 17, which are hereby incorporated by reference. Judicial

review, where available, will be in accordance with 49 U.S.C. 46110 and shall apply only to final agency decisions. A contractor may seek review of a final FAA decision only after its administrative remedies have been exhausted.

(b) The filing of a contract dispute with the ODRA may be accomplished by mail, overnight delivery, hand delivery, or by facsimile. A contract dispute is considered to be filed on the date it is received by the ODRA.

(c) Contract disputes are to be in writing and shall contain:

(1) The contractor's name, address, telephone and fax numbers and the name, address, telephone and fax numbers of the contractor's legal representative(s) (if any) for the contract dispute;

(2) The contract number and the name of the Contracting Officer;

(3) A detailed chronological statement of the facts and of the legal grounds for the contractor's positions regarding each element or count of the contract dispute (i.e., broken down by individual claim item), citing to relevant contract provisions and documents and attaching copies of those provisions and documents;

(4) All information establishing that the contract dispute was timely filed;

(5) A request for a specific remedy, and if a monetary remedy is requested, a sum certain must be specified and pertinent cost information and documentation (e.g., invoices and cancelled checks) attached, broken down by individual claim item and summarized; and

(6) The signature of a duly authorized representative of the initiating party.

(d) Contract disputes shall be filed at the following address:

(1) Office of Dispute Resolution for Acquisition, AGC-70,  
Federal Aviation Administration,  
400 7th Street, S.W., Room 8332,  
Washington, DC 20590,

Telephone: (202) 366-6400,  
Facsimile: (202) 366-7400; or

(2) other address as specified in 14 CFR Part 17.

(e) A contract dispute against the FAA shall be filed with the ODRA within two (2) years of the accrual of the contract claim involved. A contract dispute by the FAA against a contractor (excluding contract disputes alleging warranty issues, fraud or latent defects) likewise shall be filed within two (2) years after the accrual of the contract claim. If an underlying contract entered into prior to the effective date of this part provides for time



limitations for filing of contract disputes with the ODRA which differ from the aforesaid two (2) year period, the limitation periods in the contract shall control over the limitation period of this section. In no event will either party be permitted to file with the ODRA a contract dispute seeking an equitable adjustment or other damages after the contractor has accepted final contract payment, with the exception of FAA claims related to warranty issues, gross mistakes amounting to fraud or latent defects. FAA claims against the contractor based on warranty issues must be filed within the time specified under applicable contract warranty provisions. Any FAA claims against the contractor based on gross mistakes amounting to fraud or latent defects shall be filed with the ODRA within two (2) years of the date on which the FAA knew or should have known of the presence of the fraud or latent defect.

(f) A party shall serve a copy of the contract dispute upon the other party, by means reasonably calculated to be received on the same day as the filing is to be received by the ODRA.

(g) After filing the contract dispute, the contractor should seek informal resolution with the Contracting Officer.

(h) The FAA requires continued performance with respect to contract disputes arising under this contract, in accordance with the provisions of the contract, pending a final FAA decision.

(i) The FAA will pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the contract dispute, or (2) the date payment otherwise would be due, if that date is later, until the date of payment. Simple interest on contract disputes shall be paid at the rate fixed by the Secretary of the Treasury that is applicable on the date the Contracting Officer receives the contract dispute and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary until payment is made.

(j) Additional information and guidance about the ODRA dispute resolution process for contract disputes can be found on the ODRA Website at <http://www.faa.gov>.

(End of Clause)

### **3.9.1-2 Protest After Award (August 1997)**

(a) Upon receipt of a notice that a protest has been filed with the FAA Office of Dispute Resolution, or a determination that a protest is likely, the Administrator or his designee may instruct the Contracting Officer to direct the Contractor to stop performance of the work called for by this contract. The order to the Contractor shall be in writing, and shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision or other resolution of the protest, the Contracting Officer shall either--

- (1) Cancel the stop-work order; or
  - (2) For other than cost-reimbursement contracts, terminate the work covered by the order as provided in the "Default" or the "Termination for Convenience of the Government" clause(s) of this contract; or
  - (3) For cost-reimbursement contracts, terminate the work covered by the order as provided in the "Termination" clause of this contract.
- (b) If a stop-work order issued under this clause is canceled either before or after the final resolution of the protest, the Contractor shall resume work. The Contracting Officer shall make for other than cost-reimbursement contracts, an equitable adjustment in the delivery schedule or contract price, or both; and for cost-reimbursement contracts, an equitable adjustment in the delivery schedule, the estimated cost, the fee, or a combination thereof, and in any other terms of the contract that may be affected; and the contract shall be modified, in writing, accordingly, if--
- (1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and
  - (2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal submitted at any time before final payment under this contract.
- (c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.
- (d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.
- (e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.

(End of Clause)

**END OF SECTION**

## PART IV - SECTION K

### REPRESENTATIONS, CERTIFICATIONS, AND OTHER STATEMENTS OF OFFERORS

#### 3.1-1 Clauses and Provisions Incorporated by Reference (June 1999)

This screening information request (SIR) or contract, as applicable, incorporates by reference one or more provisions or clauses listed below with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make the full text available, or offerors and contractors may obtain the full text via Internet at: <http://fast.faa.gov> (on this web page, select "toolsets", then "procurement toolbox").

#### 3.2.5-2 Independent Price Determination (October 1996)

#### 3.2.5-7 Disclosure Regarding Payments to Influence Certain Federal Transactions (June 1999)

\* \* \* \* \*

#### 3.2.2.3-10 Type of Business Organization (April 1996)

The offeror, by checking the applicable box, represents that--

(a) It operates as ☐ a corporation incorporated under the laws of the State of \_\_\_\_\_, ☐ an individual, ☐ a partnership, ☐ a nonprofit organization, or ☐ a joint venture.

(b) If the offeror or quoter is a foreign entity, it operates as ☐ individual, ☐ a partnership, ☐ a nonprofit organization, ☐ a joint venture, or ☐ a corporation, registered for business in \_\_\_\_\_.  
(Country)

(End of Provision)

#### 3.2.2.3-15 Authorized Negotiators (April 1996)

The offeror represents that the following persons are authorized to negotiate on its behalf with the Government in connection with this submittal: \_\_\_\_\_ [list names, titles, and telephone numbers of the authorized negotiators].

(End of Provision)

### 3.2.2.3-70 Taxpayer Identification (August 1998)

#### (a) Definitions.

(1) "Common parent," as used herein, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

(2) "Corporate status," as used herein, means a designation as to whether the offeror is a corporate entity, an unincorporated entity (e.g., sole proprietorship or partnership), or a corporation providing medical and health care services.

(3) "Taxpayer Identification Number (TIN)," as used herein, means the number required by the IRS to be used by the offeror in reporting income tax and other returns.

(b) All offerors are required to submit the information required in paragraphs (c) through (e) of this provision in order to comply with reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). The FAA will use this information for the purpose of collecting and reporting on any delinquent amounts arising out of the respondent's relation with the Federal Government. This is pursuant to Public Law 104 -134, the Debt Collection Improvement Act of 1996, Section 31001(l)(3). If the resulting contract is subject to the reporting requirements, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

#### (c) Taxpayer Identification Number (TIN).

☐ TIN: \_\_\_\_\_

☐ TIN has been applied for.

☐ TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not leave income effectively connected with the conduct of a trade or business in the U.S. and does not have all office or place of business or a fiscal paying agent in the U.S.;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of a Federal, state, or local government;

☐ Other State basis. \_\_\_\_\_.

#### (d) Corporate Status.

☐ Corporation providing medical and health care services, or engaged in the billing and collecting of payments for such services;

☐ Other corporate entity

☐ Not a corporate entity

☐ Sole proprietorship

☐ Partnership

☐ Hospital or extended care facility described in 26 CFR 501(c)(3) that is exempt from taxation under 26 CFR 501(a).

(e) Common Parent.

☐ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this clause.

☐ Name and TIN of common parent:

Name \_\_\_\_\_  
TIN \_\_\_\_\_

(End of Provision)

**3.2.2.7-7 Certification Regarding Debarment, Suspension, Proposed Debarment, and Other Responsibility Matters (April 1996)**

(a) (1) The Offeror certifies, to the best of its knowledge and belief, that--

(i) The Offeror and/or any of its Principals--

(A) Are ☐ are not ☐ presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(B) Have ☐ have not ☐ within a three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, state, or local) contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property; and

(C) Are ☐ are not ☐ presently indicted for, or otherwise criminally or civilly charged by a governmental entity with, commission of any of the offenses enumerated in subdivision (a)(1)(i)(B) of this provision.

(ii) The Offeror has ☐ has not ☐ within a three-year period preceding this offer, had one or more contracts terminated for default by any Federal agency.

(2) 'Principals,' for the purposes of this certification, means officers; directors; owners; partners; and, persons having primary management or supervisory responsibilities within a business entity (e.g., general manager; plant manager; head of a subsidiary, division, or business segment, and similar positions). THIS CERTIFICATION CONCERNS A MATTER WITHIN THE JURISDICTION OF AN AGENCY OF THE UNITED STATES AND THE MAKING OF A FALSE, FICTITIOUS, OR FRAUDULENT CERTIFICATION MAY RENDER THE MAKER SUBJECT TO PROSECUTION UNDER SECTION 1001, TITLE 18, UNITED STATES CODE.

(b) The Offeror shall provide immediate written notice to the Contracting Officer if, at any time prior to contract award, the Offeror learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

(c) A certification that any of the items in paragraph (a) of this provision exists will not necessarily result in withholding of an award under this SIR. However, the certification will be considered in connection with a determination of the Offerors responsibility. Failure of the Offeror to furnish a certification or provide such additional information as requested by the Contracting Officer may render the Offeror nonresponsible.

(d) Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by paragraph (a) of this provision. The knowledge and information of an Offeror is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

(e) The certification in paragraph (a) of this provision is a material representation of fact upon which reliance was placed when making award. If it is later determined that the Offeror knowingly rendered an erroneous certification, in addition to other remedies available to the Government, the Contracting Officer may terminate the contract resulting from this SIR for default.

(End of Provision)

### **3.6.2-3 Walsh-Healey Public Contracts Act Representation (January 1998)**

The offeror represents as a part of this offer that the offeror is ☐ or is not ☐ a regular dealer in, or is ☐ or is not ☐ a manufacturer of, the supplies offered.

(End of Provision)

### **3.6.3-1 Clean Air and Water Certification (April 1996)**

The Offerors signature on this Contract constitutes an affirmative attestation that:

(a) Any facility to be used in the performance of this Contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities.

(b) The Offeror will immediately notify the Contracting Officer, of the receipt of any communications from the Administrator, or a designee, of the EPA, indicating that any facility that the Offeror uses for the performance of the Contract is under consideration to be listed on the EPA List of Violating Facilities; and

(c) The Offeror will include a certification substantially the same as this certification, including this paragraph (c) in every nonexempt subcontract.

(End of Provision)

**3.6.3-10 Certification of Toxic Chemical Release Reporting (August 1998)**

(a) Submission of this certification is a prerequisite for making or entering into this contract imposed by Executive Order 12969, August 8, 1995.

(b) By signing this offer, the offeror certified that –

(1) As the owner or operator of facilities that will be used in the performance of this contract that are subject to the filing and reporting requirements described in section 313 of the emergency Planning and Community Right-to-Know Act of 1986 (EPCRA)(42 U.S.C. 11023) and Section 6607 of the Pollution Prevention Act of 1990 (PPA)(42U.S.C. 13106), the offeror will file and continue to file for such facilities for the life of the contract the Toxic Chemical Release Inventory Form (Form R) as described in section 313(a) and (g) of EPCRA and Section 6607 of PPA; or

(2) None of its owned or operated facilities to be used in the performance of this contract is subject to the Form R filing and reporting requirements because each such facility is exempt for at least one of the following reasons: (Offeror is to check each block that is applicable)

\_\_\_\_\_(i) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under Section 313(c) of EPCRA, 42 U.S.C. 11023(c);

\_\_\_\_\_(ii) The facility does not have 10 or more full-time employees as specified in Section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

\_\_\_\_\_(iii) The facility does not meet the reporting thresholds of toxic chemicals established under Section 313(f) of EPCRA, 42 U.S.C. 11023(f)(A) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

\_\_\_\_\_(iv) The facility does not fall within Standard Industrial Classification Code (SIC) designations 20 through 39, or;

\_\_\_\_\_(v) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(End of Provision)

**3.6.4-15 Buy American Act Certificate** (July 1996)

(a) The offeror certified that each end product, except as listed below, is a domestic end product (as defined in the clause "Buy American Act Supplies") and components of unknown origin are considered to have been mined, produced, or manufactured outside the United States.

Excluded End Product	Country of Origin

(list as necessary)

(b) The offeror agrees to furnish any additional information as the Contracting Officer may request to verify the above information and to evaluate the offer. Offerors may obtain from the Contracting Officer lists of articles, materials and supplies excepted from the Buy American Act.

(End of Provision)

**END OF SECTION**



**PART IV - SECTION L**  
**INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS**

**3.1-1           Clauses and Provisions Incorporated by Reference (June 1999)**

This screening information request (SIR) or contract, as applicable, incorporates by reference one or more provisions or clauses listed below with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make the full text available, or offerors and contractors may obtain the full text via Internet at: <http://fast.faa.gov> (on this web page, select "toolsets", then "procurement toolbox").

**3.2.2.3-3       Affiliated Offerors (April 1996)**

**3.2.2.3-14      Late Submissions, Modifications, and Withdrawals of Submittals (October 1996)**

**3.2.2.3-16      Restriction on Disclosure and Use of Data (April 1996)**

**3.2.2.3-17      Preparation of Offers (October 1996)**

**3.2.2.3-18      Explanation to Prospective Offerors (April 1996)**

**3.2.2.3-19      Contract Award (April 1996)**

**3.13-5           Seat Belt Use by Contractor Employees (January 1999)**

**3.9.1-3          Protest (August 1999)**

\* \* \* \* \*

**FAA Alaskan Region Clause**  
**Single or Multiple Awards**

The FAA reserves the right to make a single award or multiple awards for combinations of the Contract Line Items that present the best value; or, FAA may elect to either purchase all, part, or none of the proposed Capstone Equipment under this Contract.

**3.2.2.3-9       Notice of Possible Standardization (April 1996)**

If the supplies for which this Screening Information Request (SIR) has been issued are established as standard, future contracts for the required supplies may be awarded without providing for competition.

(End of Provision)

**3.2.2.3-12 Amendments to Screening Information Requests (April 1996)**

(a) If this SIR is amended, then all terms and conditions which are not modified remain unchanged.

(b) Offerors shall acknowledge receipt of any amendment to this SIR by (1) signing and returning the amendment, (2) identifying the amendment number and date in the space provided for this purpose on the form for submitting an offer, (3) letter or telegram, (4) facsimile, if facsimile offers are authorized in the SIR, or (5) electronic commerce response, if electronic commerce responses are authorized in the SIR. The Government must receive the acknowledgment by the time specified in the SIR for receipt of submittals.

(End of Provision)

**3.2.4-1 Type of Contract (April 1996)**

The FAA contemplates award of a FIRM-FIXED PRICED contract resulting from this Request for Offer.

(End of Provision)

**3.13-4 Contractor Identification Number—Data Universal Numbering System (DUNS) Number (August 1997)**

(a) "Contractor Identification Number," as used in this provision, means "Data Universal Numbering System (DUNS) number, which is a nine-digit number assigned by Dun and Bradstreet Information Services.

(b) Contractor identification is essential for complying with statutory contract reporting requirements. Therefore, the offeror shall submit its DUNS number, annotated as "DUNS" following its name and address on the cover sheet of its proposal.

(c) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

- (1) Company name.
- (2) Company address.
- (3) Company telephone number.
- (4) Line of business.
- (5) Chief executive officer/key manager.
- (6) Date the company was started.
- (7) Number of people employed by the company.

(8) Company affiliation.

(d) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at <http://www.dbis.customer/custlist.htm>. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at [globalinfo@dbisma.com](mailto:globalinfo@dbisma.com).

(End of Provision)

**L-0 PROPOSAL SUBMISSION:**

**L-1. Any questions regarding the Request for Offer, shall be submitted in writing and sent to the following:**

**FEDERAL AVIATION ADMINISTRATION  
ATTN: KARLA W. SHAW, AAL-59A  
CAPSTONE PROGRAM  
222 WEST 7TH AVENUE, #14  
ANCHORAGE, AK 99513-7587**

Questions may also be faxed to (907) 271-2326, using the same attention line as above; or a cc:Mail to [karla.shawshaw@faa.gov](mailto:karla.shawshaw@faa.gov)

**Additional information to reach the Contracting Officer is as follows:**

**Phone: (907) 271-5859**

Questions will be accepted during the solicitation period, starting with the day of release. Questions will not be accepted after **August 24, 2001**. Responses to questions will be answered within three working days, after receipt of the question.

**L-2 Offerors shall submit TWO sets of their proposals, and shall keep each portion of their proposal separate, such as the technical proposal, the business proposal and the cost proposal. Reference to any costs shall not appear in the technical proposal. Offerors are also reminded to comply with the Provision 3.2.2.3-16, Restriction and Disclosure and Use of Data to protect their proposals from any future disclosure.**

**L-3 Offerors shall submit information such that all of the items of the Statement of Work can be verified.**

**L-4. Offerors who are unable to meet any of the above specifications must clearly state which specification(s) will not be met and clearly state what is being offered in lieu of.**

**L-5.** Offerors who are offering a feature or equipment that exceeds the above specifications must clearly state what is being offered and how it exceeds the specifications. Otherwise, the fact the feature or equipment being offered exceeds the specifications will not be considered by the FAA in determining which proposal represents the best value to the FAA.

**L-6.** Offerors may also submit proposals for alternative features and equipment by clearly indicating what each alternative is, whether it is an addition or substitution, and how much the inclusion or deletion of the alternative will increase or decrease the price of each line item.

#### **L-7. TECHNICAL PROPOSAL FOR THE AVIONICS SYSTEM**

The offeror shall submit a detailed description of the Capstone Avionics System. This description shall include at least the following items:

a. Data supporting compliance or exceeding compliance with each specification identified in the Statement of Work.

b. Engineering three-view drawings of the Capstone avionics system components.

c. Photographs of the Capstone avionics system components and all the displays presented on the primary navigational display.

d. A detailed written description of the physical and functional specifications of the Capstone Avionics System.

e. Functional block diagrams.

f. Installation diagrams and instructions.

g. Proof of FAA certification of the Capstone avionics system components or an FAA Certification Plan.

h. Software specifications and certification plan.

i. Verification of databases used in the Capstone avionics system.

j. Human factors report on the pilot-vehicle interface as specified in the Statement of Work.

k. Operating Handbook(s).

l. Flight Demonstration Plan.

## **L-8. PROPOSAL FOR THE BUSINESS PLAN**

The offeror shall submit a Business Plan that includes as a minimum the following information:

- a. Resumes of critical staff in the design, manufacture, test, engineering, and certification, as described in the Statement of Work, Paragraph G-3.
- b. Ability to produce equipment to time schedule.
- c. Past Performance: Production and certification history.
- d. Current production and certification ability.

## **L-9 PROPOSAL FOR COSTS**

a.. Should the Offeror determine that the cost of the avionics equipment for the fixed-wing aircraft is different than the avionics equipment for the rotorcraft the prices are to be shown on the Offer Schedule. If there is no difference in the price, the Offer Schedule shall be annotated as such. The Offeror shall also provide a detailed explanation of where the price difference is, between the avionics equipment for the fixed-wing and for the rotorcraft.

b. The offeror shall submit a detailed cost proposal, that correlates to the line items of the Offer Schedule in Section B.

END OF SECTION

## **PART IV - REPRESENTATION AND INSTRUCTIONS**

### **SECTION M**

#### **EVALUATION FACTORS FOR AWARD**

##### **3.2.2.3-34 Evaluation of Offers for Multiple Awards (April 1996)**

In addition to other factors, offers will be evaluated on the basis of advantages and disadvantages to the Government that might result from making more than one award (multiple awards). It is assumed, for the purpose of evaluating submittals, that \$500 would be the administrative cost to the Government for issuing and administering each contract awarded under this Screening Information Request (SIR) and individual awards shall be for the items or combinations of items that result in the lowest aggregate cost to the Government, including the assumed administrative costs.

(End of Provision)

##### **M-1. General**

Selection and award will be made to the responsive, responsible Offeror that provides the overall greatest value to the FAA. Therefore, the successful Offeror may not necessarily be the one with the lowest cost. Award will be made to the Offeror whose combined technical, business, and cost proposals conforming to the solicitation is most advantageous to the FAA. Technical competence is most important, followed by business, followed by cost. As the difference in competitive technical scores decreases, the relative importance of business and cost may increase.

##### **M-2. Basis for Award**

The evaluation criteria, which are listed in descending order of importance, are:

- a. Technical.
- b. Business.
- c. Cost

All Offerors will be required to submit technical, business, and cost proposals that respond to the Request for Offer. All offers will be subject to detailed technical, business, and cost evaluation by teams which rate each in accordance with a pre-established evaluation plan.

Only the factors and criteria described in this Section will be used in evaluating the proposals and the same factors and criteria will be used on all proposals submitted for evaluation.

The technical proposals and the business proposals will be numerically scored as follows:

Score	Description
80-100	Highly acceptable
50-79	Acceptable
20-49	Unacceptable, but possibly correctable by the Offerors clarifications submitted in response to questions from the Contracting Officer
0-19	Unacceptable, and viewed as an uncorrectable deficiency

A score of less than 20 in any of the technical criteria or any of the business criteria is basis for exclusion from the competitive range. An unrealistic or unreasonable cost offer also is basis for exclusion from the competitive range. Offerors are cautioned not to minimize the importance of an adequate response in any area because it appears to carry less weight than another segment or because it is not scored. Each segment contains information that will assist in the overall evaluation of the proposal and should be prepared accordingly. The FAA will reject as grossly deficient, any technical proposal, business proposal, or cost proposal which fails to address the requirements of the solicitation, and which the FAA considers that correction would involve significant and major rewriting of the proposal. Each section of the proposal, and the specifics thereunder (if any), must be discussed in a separate, clearly identified, part of the proposal in order to facilitate evaluation.

The contents of the cost proposal will not be numerically scored but will be evaluated for realism, completeness, reasonableness, and compatibility with the technical offer.

Prospective offerors are forewarned that a proposal meeting the solicitation requirements with the lowest cost may not be selected if award to a higher cost proposal is more advantageous to the Government.

### **M-3. Proposal Evaluation Criteria**

Technical and business abilities will be evaluated on the basis of the offerors proposals. Elements of the proposals may be evaluated by more than one team and against more than one criterion. Proposals will be evaluated to assess the degree of compliance, completeness, commitment and/or capability of the offeror to accomplish the requirements of this solicitation.

#### **M-3.1. Technical Proposal Evaluation**

The Capstone Avionics System will be evaluated using the following criteria:

a. Achievement of the required specifications from the Statement of Work in the design of the Capstone Avionics System.

b. Human Factors analysis of the proposed equipment.

c. Size and weight of the Capstone Avionics Systems. The size and weight should be such that the Capstone Avionics System can be installed in a Cessna Model 172 airplane or a Bell Model 206 helicopter and provide the least amount of impact on the useful load of the aircraft.

### **M-3.2 Business Proposal**

The business proposal will be evaluated using the following criteria:

a. Resumes of critical staff in the design, manufacture, test, engineering and certification, as described in the Statement of Work, Paragraph G-3.

b. Ability to produce and deliver equipment in accordance with the time schedule.

c. Past Performance: Production and certification history,

d. Current production and certification ability.

### **M-3.3. Cost Proposal**

Cost will not be a scored criterion, but it will be evaluated for reasonableness, realism, and as a measure of the offerors understanding of the Scope of Work. As differences in competitive technical and business scores decreases, the relative importance of cost may increase.

It is not expected that cost will be as important as the technical or business factors set forth in the solicitation, and it will not necessarily be controlling. However, it is an important factor. The degree of its importance in the final selection will increase as other evaluation results become more equal. If technical and business scores are close, the estimated cost may be the only or primary discriminating factor. Cost will be evaluated on the basis of:

a. Realism, or level of confidence, in the offerors proposed costs and prices.

b. Completeness of proposed costs.

c. Reasonableness of proposed costs

d. Compatibility of proposed costs with the technical proposal.

END OF SECTION